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ABSTRACT

This report presents test results derived from the student testing that was conducted in 1983-84 under the aegis of the California Assessment Program (CAP). All third, sixth, eighth, and twelfth grade students in California public schools were tested in reading, written language, and mathematics. The highlight of the 1983-84 expansion of CAP was the implementation of a first-time test in grade eight: the Survey of Academic Skills Grade 8. Results of the new test are included in each of the content areas of this report. A pilot study was conducted in the spring of 1984 to develop a statewide direct writing assessment. The report's findings included the following: (1) California third graders are slightly below the national average in reading and written language and slightly above in mathematics; (2) sixth graders are right at the national average in reading and written language and substantially above it in mathematics; (3) twelfth graders are below the national averages in written language, reading, and mathematics. Chapters III through V include detailed reports of the areas of reading, written expression, and mathematics, as well as conclusions and recommendations of the statewide advisory committee. Supplementary information is given about students' habits concerning homework, reading, and television watching. Chapters VI and VII assess the future of science, and history-social science expansion of the grade eight test. Chapter VIII describes results of a variety of equating studies that compared California students with a variety of national and international samples of students at each grade level. The appendix lists members of assessment advisory committees. (LMO)

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Student Achievement in California Schools

1983-84 Annual Report

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California Assessment Program

CALIFORNIA STATE DEPARTMENT OF EDUCATION Bill Honig—Superintendent of Public Instruction Sacramento

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Student Achievement in California Schools

1983-84 Annual Report

Prepared under the Direction of
Alexander I. Law, Director
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I. Summary of Findings

During the 1983-84 school year, all third, sixth, eighth, and twelfth grade students in California public schools were tested in reading, written language, and mathematics. All eighth grade students took the Survey of Academic Skills: Grade 8, a CAP test first administered in 1983-84. The reading questions on the new test are based on reading passages covering the areas of literature, science, and social science. Higher-level comprehension is emphasized in the array of questions. Written expression questions are based on student essays related to the reading passages. In mathematics, computational abilities, problem solving, and prealgebra and geometry skills are assessed. Statewide test results are summarized in Table 1.

Reading Results

Reading specialists from throughout the state reviewed the results of CAP reading tests. Their conclusions were as follows:

- Third grade reading test scores improved by five scaled score points, marking a 17-year trend of improving reading test scores in California at this grade level.
- Reading scores declined at the sixth grade level (by four scaled score points) for the second consecutive year and at the twelfth grade level (down by 0.9 percent correct) for six of the previous seven years.
- Trend data are not available for the eighth grade since the test is new this year. Eighth grade students encountered greatest difficulty with critical thinking skills, such as comparison and contrast, justifying inferences, and separating fact from opinion.
- The pattern of results suggests that many students are having difficulty making the transition from understanding very familiar general interest stories commonly used in the primary grades to reading in content areas, such as history-social science and science, which require knowledge of a particular vocabulary and certain abstract concepts.

Written Language Results

A panel of English language experts from across the state reviewed the results of the CAP written language tests. They concluded the following:

- Third grade written language scores showed a fourth year of sizable gains in all skill areas tested.
- Written language scores improved slightly for sixth grade, but some of the reading-related skills, such as paragraphing, registered declines.
- Twelfth grade written language scores declined for the second consecutive year.
- Eighth grade test scores indicated that students performed more strongly on items involving mechanics (e.g., usage, capitalization, punctuation) than on items calling for judgment (e.g., critical thinking, organization, language choices).

- Both sixth grade and twelfth grade students showed losses on (1) language-choice questions demanding an understanding of the appropriateness and nuances of words; and (2) a variety of questions about paragraphs, such as supplying topic sentences, and supporting details and identifying irrelevant material.

Mathematics Results

Mathematics educators from throughout California reviewed the results of the mathematics portion of the tests. Their conclusions were as follows:

- Third grade students showed large, consistent increases in scores on all measures assessed on the test.

- Sixth grade students also showed increases; however, the gains were not as strong as those made by third grade students. The increases in scores of sixth grade students were primarily in computational skills. Scores declined slightly or showed weaker gains in problem solving and in items involving higher-level thinking.

- Because the 1983-84 school year was the first year of eighth grade testing, trend data are not available. The results, however, indicated that eighth grade students were having the same difficulties as sixth and twelfth grade students. Their performance was weak on higher-level thinking skills problems--for example, two-step word problems.

- The scores of twelfth grade students dropped in almost all skill areas measured on the test.

National Norms

Special studies were conducted to equate the performance of students on the CAP tests with the performance of students across the nation. The result of this type of "equating study" is to show how California's students would have compared to a national norm group if all the California students had taken the published test.

The norms represent the estimated percentile rank that the median California student would have achieved on the corresponding nationally normed test. The data from the equating studies along with a description of the findings can be found in Chapter VIII. In brief, the comparisons on the basis of estimated national norms reveal the following:

Grade 3. Because of nationwide progress in the lower grades, the most recent comparisons show that California's students are slightly below the national average in reading and written language and slightly above in mathematics.

Grade 6. Students in California are right at the national average in reading and written language and substantially above it in mathematics.

Grade 8. The two comparisons available now generally indicate that California's students lose considerable ground from grade six to grade eight,

especially in reading and mathematics. For example, on the Comprehensive Tests of Basic Skills (CTBS), the drop was from the 51st to the 39th percentile in reading and from 62nd to the 48th in mathematics.

Grade 12. In spite of nationwide declines, California's seniors are still below national averages on the basis of three different tests with 1978 norms. They are considerably lower in written language, less so in reading; they do their best in mathematics.

Scholastic Aptitude Test

Chapter VIII also contains another kind of indicator of how California's students compare with students nationwide: the Scholastic Aptitude Test scores for California and the nation since 1971-72. The latest results show that California's students are maintaining a small advantage over the national average in mathematics. In verbal skills, California's students fell a little bit further behind the national average. Gains in verbal skills generally are less than in mathematics; scores in both areas are still considerably behind what they were in the peak year of 1963. (See Chapter VIII for details.)

Table 1

Numbers of Students Tested and Average Test Score, by Grade Level and Content Area, from 1979-80 Through 1983-84
California Assessment Program

Grade level and content area (number tested)	Average test score					Difference			
	1979-80	1980-81	1981-82	1982-83	1983-84	1979-80 to 1980-81	1980-81 to 1981-82	1981-82 to 1982-83	1982-83 to 1983-84
Grade 3 (268,408)									
Reading	250	254	258	263	268	+4	+4	+5	+5
Written Language	250	255	260	266	272	+5	+5	+6	+6
Mathematics	250	254	261	267	274	+4	+7	+6	+7
Grade 6 (275,835)									
Reading	250	252	254	253	249	+2	+2	-1	-4
Written Language	250	253	257	259	260	+3	+4	+2	+1
Mathematics	250	253	258	260	261	+3	+5	+2	+1
Grade 8 (297,236)									
Reading	--	--	--	--	250	--	--	--	--
Written Language	--	--	--	--	250	--	--	--	--
Mathematics	--	--	--	--	250	--	--	--	--
Grade 12 (210,024)									
Reading	63.1	63.4	63.2	63.1	62.2	+0.3	-0.2	-0.1	-0.9
Written Language	62.4	63.1	63.2	63.0	62.6	+0.7	+0.1	-0.2	-0.4
Spelling	68.8	69.0	69.5	69.5	69.4	+0.2	+0.5	0	-0.1
Mathematics	66.8	68.0	67.7	67.7	67.4	+1.2	-0.3	0	-0.3

Note: The scores for grades three, six, and eight are reported in scaled score units. These scores range from approximately 100 to 400 with a statewide average of 250. The base year for grades three and six was 1980. The grade eight test was first administered this year, 1983-84. The scores for grade twelve continue to represent the percentage of questions answered correctly.

II. Introduction

The test results presented in this report are derived from the student testing that was conducted in 1983-84 under the aegis of the California Assessment Program. Different types of testing programs present different types of information. The information yielded and the usefulness of the information are shaped by the types of test questions posed, the levels of knowledge and types of thinking skills tapped, and the emphasis placed on the different domains of learning. These choices, in turn, are shaped by the purposes that the testing program was designed to meet.

The tests used in California have undergone a number of major changes. The brief review of statewide testing in California presented below is meant to help the reader gain a surer grasp of the findings of this report by providing a context--a context drawn from a short history of testing and from a glimpse of major improvements to the program now underway.

A Beginning--1962-1972

Statewide educational achievement testing began in California in 1962, triggered by a recommendation of a statewide citizens advisory committee. From 1962 through 1972 a variety of grades were tested in California schools with one or more standardized achievement tests. These tests were selected primarily on the basis of their psychometric properties. Little attention was paid to their match with the curricula of the over 1,000 districts in California. The tests, which measured reading, written language, and mathematics, took about four hours to administer and were expected to serve local purposes as well as statewide needs.

Two concerns of educators led to eventual changes in the testing program: (1) The tests were considered in many cases to be poorly matched with what was taught in school districts (common tests were required of all districts by 1965); and (2) the time spent in testing was considered disproportionate to the amount of information gained.

California Tests for California Schools--1973-1984

As a result of the two chief sources of dissatisfaction--curriculum mismatch and testing time--the California Assembly Education Advisory Committee reviewed the program and made far-reaching proposals. It recommended separating local testing and statewide testing into distinct testing programs. Local testing could, then, use a variety of tests to meet the needs of schools and districts. State testing would be done by a new technique known as matrix sampling.

Since the main purpose of statewide testing was deemed to be program evaluation, the new technique of matrix sampling was a perfect tool. It allowed more reliable information to be gathered, a broader array of curricular goals to be covered, and substantially less time to be spent on testing. As implemented

in California, this new technique of matrix sampling took the form of a very long test--over 1,000 items per grade level--divided into many, nonoverlapping forms (varying from 16 to 40 at different grade levels). This means that in grade six, for instance, each of the 30 students in a typical classroom takes a different "test." Each test contains about 30 questions in the areas of reading, written expression, and mathematics. Each test can be completed in about a half hour. The results, by design, are not reported for individual students. They are aggregated to provide stable average scores for the group and a wide variety of group scores for subskills within each content area.

During this same period another step forward was represented by the development and implementation of a statistical technique that solved a longstanding problem. Whenever a new test was introduced at any grade level, the results would cease to be comparable to those of the previously used test. The new technique, known as item response methodology, was first implemented in 1980 in grade three. It allowed test scores to be reported on a common metric, or scale, so that scores from old tests to new tests can be compared across grade levels and content areas. As instituted in California, the scale takes the form of a statewide average score of 250 at each grade level, with most schools scoring between 100 and 400. Since the results for schools and districts are reported on this scale, it is possible for school personnel and the public to interpret scores without undue reliance on the district percentile ranks, which have led to considerable misunderstanding of the results.

A New Beginning--1983-84

The new era of educational reform in California schools called for an upgrading of the assessment program. More information and better information was needed by teachers and administrators. Certain gaps in information needed to be filled, such as the need for information between the distant points of grades six and twelve; hence testing in grades eight and ten was mandated by SB 813. The call for higher standards requires test information on how well students can solve problems, think critically, reason logically, and perform other higher-level thinking tasks. The earlier emphasis on the "basics" gave way to a reemphasis on other important areas of the curriculum, such as science, literature, and history. Unless these areas are represented in the assessment program, they probably will not receive the attention they deserve.

The highlight of the 1983-84 portion of the expansion of CAP was the implementation of a first-time test in grade eight. The test consists of 1,260 questions covering reading, written expression, and mathematics. The reading portion of the test emphasizes comprehension skills in the context of reading passages drawn from the content areas of science, history-social science, and literature. Written expression focuses on the making of critical judgments required in the task of writing along with the traditional skills involving standard usage and the conventions of English. Mathematics focuses on problem solving and the application of skills that are learned throughout the elementary and junior high years. The results of the new test are reported in each of the content area chapters of this report.

A persistent inadequacy of traditional achievement testing in California, or elsewhere, is the almost exclusive use of multiple-choice test items. This type of question yields efficient and accurate assessments of students' skills;

however, students' ability to compose a piece of well-written prose, for example, obviously cannot be assessed with multiple-choice exercises, even though such exercises are related to the ability to write well.

In search of a resolution to the implied dilemma of multiple-choice testing, the Department of Education conducted a pilot study involving 54 California schools in the spring of 1984. In the study over 12,000 students were each asked to write on two of 18 different topics. The essays were scored during the summer and fall of 1984, and results are now being analyzed. Following a full analysis, a separate report on the findings will be published. It is anticipated that this study will not only indicate how well California students can actually write but also will demonstrate some of the problems and potential solutions to the implementation of a statewide direct writing assessment.

Toward a Comprehensive Assessment System--1984-85 and Beyond

The completion of the testing reform agenda will, in the near future, lead to the development of a high-level test in grade ten; the assessment of science and history-social science achievement in grade eight, then grade ten, then grades six and twelve; the implementation of direct writing assessment at several grade levels; and finally, the revision of the grade twelve test, which has not been revised since 1975-76, when it was designed as a test of the "basic skills"--a role it adequately fills, but without providing an adequate measure of more demanding high school content.

The most ambitious goal of the testing reform is the development of a whole new testing system--a comprehensive assessment system. The new program rests on the agreement that there exists a body of knowledge, skills, and understandings that all students in California, regardless of background or aspirations, should have the opportunity to learn. The envisioned testing system should provide individual student results for use by teachers, students, and parents as well as the school, district, and state level results now provided.

The design, development, and implementation of the new program calls for collaboration among the State Department of Education, the school districts, and the test publishing and scoring firms that currently serve California schools. Over the course of the next several years, a system will be developed and implemented to enable school districts to develop a testing program to meet the objectives of their instructional programs while simultaneously providing local information on the core statewide objectives and information for state level program development and policy analysis. It will consolidate the often overlapping and duplicative existing testing programs that have been developed in isolation to meet specific needs. The technology now exists to merge these programs into a flexible yet comprehensive system, which can reduce testing and provide better information about the strengths and weaknesses of California students and school programs.

The Structure of This Report

The next three chapters of this report present the basic findings for each of the content areas of reading, written expression, and mathematics. Each chapter includes the conclusions and recommendations of the statewide advisory

committee and, where appropriate, relevant supplementary information about students' homework, reading, and television watching habits.

Chapters VI and VII provide a glimpse into the future--a future in which science, history-social science, and literature are also assessed. They describe the steps taken and tasks accomplished at the level of science and history-social science tests for grade eight. Perhaps of more interest, they also provide some hints about common areas of strength and weakness in these areas for California junior high students.

Finally, Chapter VIII presents the results of a variety of equating studies that make it possible to see how California students compare with a variety of national samples of students of each grade level.

III. Reading

Highlights of the results:

- Third grade reading scores improved for the seventeenth year; sixth and twelfth grade scores declined; grade eight was tested for the first time.
- Grade six scores improved in only one area: separating fact from opinion. Scores declined more in comprehension of literature passages than in comprehension of science and social studies passages.
- Eighth graders registered the highest scores in literal comprehension skills and encountered greatest difficulty in critical thinking areas, such as comparison and contrast, justifying inferences, and formulating critical questions.
- Sixth graders are watching more television than they did four years ago, doing more homework, reading about the same amount for pleasure, but enjoying it less (see chapter on written expression).
- Sixth and eighth graders watch television three times as much as they read for pleasure.
- Twelfth graders spend less time reading and less time watching television than they did four years ago.
- At grades six, eight, and twelve, higher test scores are associated with lesser amounts of television viewing and greater amounts of reading for pleasure.

Also in this chapter:

- The state reading advisory committee's interpretation of reading results for all grades tested
- A review of recent research into reading education
- The committee's recommendations for students, teachers, administrators, and parents

In 1983-84 reading skills were assessed at grades three, six, eight, and twelve as part of the California Assessment Program. The Survey of Basic Skills: Grade 3 was introduced in 1980; the revised Survey of Basic Skills: Grade 6, in 1982; and the new Survey of Academic Skills: Grade 8, in 1984. The Survey of Basic Skills: Grade 12 was first implemented in 1975-76 and is currently being revised to reflect the Department's Model Curriculum Standards, Grades Nine Through Twelve (Sacramento: California State Department of Education, 1985).

Decisions about the emphasis and breadth of content for the reading section of each CAP test were made by the Reading Assessment Advisory Committee, a panel of reading specialists representing a cross section of geographical regions, institutions, instructional levels, and professional groups throughout California (their names are listed in the Appendix). In making decisions about test content, the committee members began with the educational philosophy set forth in the Reading Framework for California Public Schools: Kindergarten Through Grade Twelve (Sacramento: California State Department of Education, 1980) and the Handbook for Planning an Effective Reading Program (Sacramento: California State Department of Education, 1983). The committee also considered information from reviews of skills lists by teachers and curriculum planners (in which all districts were invited to participate), content analyses of textbooks, student interest responses to test passages, and teacher judgments of the quality of test questions.

As a result of this process, the advisory committee decided that all CAP reading tests should emphasize reading comprehension, especially higher-order levels of comprehension, identified on the test reports as inferential, interpretive, and critical/applicative comprehension. All four tests include literal, interpretive, and inferential skills; however, the third grade test excludes critical/applicative questions. Tests at all grade levels cover vocabulary and study-locational skills (library/reference skills and use of maps, graphs, and charts). Phonics and structural analysis skills are assessed only at grade three.

The current third grade test consists of familiar, high-interest passages covering a range of difficulty levels appropriate to grade three. The passages on the sixth and eighth grade reading tests were drawn from literature, science, and social studies materials appropriate for those grade levels. This design feature allows for the reaggregation and reporting of scores according to the content area of the passages so that vocabulary and comprehension performance can be compared from content area to content area. The current twelfth grade test is based on a broad array of reading materials from different disciplines and contexts, but reading in the content area reporting is not possible at this grade level at the present time.

Reading Results

The 1983-84 results for the CAP reading tests at grades three, six, eight, and twelve are shown in tables 2, 3, 4, and 5. Year-to-year changes in overall performance and in skill area performance are also shown in the tables.

The members of the Reading Assessment Advisory Committee analyzed, interpreted, and evaluated the 1983-84 reading results for grades three, six, eight, and twelve. After studying the data presented in Tables 2, 3, 4, and 5, members of the committee were particularly impressed with the following major findings:

- At grade three, reading scores showed a gain of 1.0 percent correct, marking the fourth year of gains registered on the reading section of the revised Survey of Basic Skills: Grade Three. This year marks the seventeenth consecutive year of improvement for third grade reading scores in California (a fact that is determined through equating studies with other tests).

- At grade six, reading scores declined by 0.7 percent correct, marking the second year of declining scores in reading achievement at this grade level. This decline followed a five-year trend of improving scores.

- A new test, the Survey of Academic Skills: Grade 8, was administered for the first time in 1983-84. The mean score for California's eighth grade students was 64.8 percent correct. These results were reviewed as base line data because it was the first year the test was given.

- At grade twelve the reading scores declined by 0.9 percent correct, continuing a downward trend in California that has occurred for seven of the last eight years.

Grade Three

Members of the Reading Assessment Advisory Committee were very pleased to observe the seventeenth consecutive year of improvement shown on third grade reading scores in California. They were also pleased to note that one of the most important comprehension skills, reading for main ideas, has shown an overall gain of 4.3 percent correct since the present test was first administered. The committee observed that scores in the more mechanical areas, word identification and study-locational skills, were considerably higher than those for vocabulary and comprehension and that the structural analysis skills have registered the largest cumulative gains (4.7 percent correct for prefixes, suffixes and roots; 4.7 percent correct for contractions and compound words) since 1980.

The members of the committee expressed the concern that instruction in phonics and study skills not receive undue emphasis at the expense of comprehension and vocabulary and that phonics instruction be tied back into the reading of stories and other interesting literature. It is in respect to this latter point that schools fail according to Jeanne Chall, professor of education at Harvard University and author of Learning to Read: The Great Debate and Stages of Reading Development (Education Week, September 5, 1984, Vol. IV, No. 1, p. L11).

Table 2

Reading Scores of California Third Grade Students on the Survey of Basic Skills: Grade 3, 1979-80 Through 1983-84

Skill area	Number of questions	Average percent correct score					Change in score				Total
		1979-80	1980-81	1981-82	1982-83	1983-84	1979-80 to 1980-81	1980-81 to 1981-82	1981-82 to 1982-83	1982-83 to 1983-84	1979-80 to 1983-84
TOTAL READING	270	70.0	70.6	71.5	72.7	73.7	+0.6	+0.9	+1.2	+1.0	+3.7
Word identification	60	76.5	77.3	78.2	79.4	80.3	+0.8	+0.9	+1.2	+0.9	+3.8
Phonics	30	78.9	79.6	80.3	81.2	81.7	+0.7	+0.7	+0.9	+0.5	+2.8
Vowels	15	77.7	78.4	79.0	80.0	80.7	+0.7	+0.6	+1.0	+0.7	+3.0
Consonants	15	80.1	80.8	81.6	82.3	82.8	+0.7	+0.8	+0.7	+0.5	+2.7
Structural analysis	30	74.2	75.0	76.2	77.6	78.9	+0.8	+1.2	+1.4	+1.3	+4.7
Prefixes, suffixes, roots	18	69.0	69.7	71.0	72.4	73.7	+0.7	+1.3	+1.4	+1.3	+4.7
Contractions and compounds	12	82.1	82.8	84.0	85.4	86.8	+0.7	+1.2	+1.4	+1.4	+4.7
Vocabulary	30	62.5	62.8	64.0	64.9	66.4	+0.3	+1.2	+0.9	+1.5	+3.9
Recognizing word meanings	16	68.5	68.8	70.1	71.2	72.4	+0.3	+1.3	+1.1	+1.2	+3.9
Using context with multiple-meaning words	14	55.7	55.9	57.1	57.6	59.4	+0.2	+1.2	+0.5	+1.8	+3.7
Comprehension	150	65.8	66.2	67.0	68.3	69.2	+0.4	+0.8	+1.3	+0.9	+3.4
Literal	74	65.2	65.7	66.4	67.8	68.6	+0.5	+0.7	+1.4	+0.8	+3.4
Details	37	63.5	64.0	64.6	65.9	66.7	+0.5	+0.6	+1.3	+0.8	+3.2
--from single sentence	20	63.7	64.1	64.9	66.3	67.1	+0.4	+0.8	+1.4	+0.8	+3.4
--from two or three sentences	17	63.1	63.9	64.3	65.5	66.3	+0.8	+0.4	+1.2	+0.8	+3.2
Pronoun references	18	70.9	71.1	72.0	73.3	74.5	+0.2	+0.9	+1.3	+1.2	+3.6
Sequence	19	63.2	63.9	64.6	66.1	66.6	+0.7	+0.7	+1.5	+0.5	+3.4
Inferential	76	66.3	66.8	67.5	68.7	69.9	+0.5	+0.7	+1.2	+1.2	+3.6
Main idea	19	69.5	70.1	71.3	72.5	73.8	+0.6	+1.2	+1.2	+1.3	+4.3
Cause and effect	20	66.8	67.1	67.9	69.3	70.3	+0.3	+0.8	+1.4	+1.0	+3.5
Drawing conclusions	37	64.3	64.9	65.4	66.5	67.7	+0.6	+0.5	+1.1	+1.2	+3.4
--about characters	15	70.5	71.0	72.1	73.2	74.3	+0.5	+1.1	+1.1	+1.1	+3.8
--from details	12	56.5	56.9	57.0	58.0	59.4	+0.4	+0.1	+1.0	+1.4	+2.9
--from overall meaning	10	64.4	65.2	65.4	66.8	67.7	+0.8	+0.2	+1.4	+0.9	+3.3
Study-locational	30	85.9	86.7	87.8	88.9	89.8	+0.8	+1.1	+1.1	+0.9	+3.9
Alphabetizing	15	82.2	83.1	84.0	85.3	86.0	+0.9	+0.9	+1.3	+0.7	+3.8
Table of contents	15	89.5	90.3	91.6	92.5	93.5	+0.8	+1.3	+0.9	+1.0	+4.0

Table 3

Reading Scores of California Sixth Grade Students on the Survey of Basic Skills: Grade 6, 1981-82 Through 1983-84

Skill area	Number of questions	Average percent correct score			Change in average percent correct score		
		1981-82	1982-83	1983-84	1981-82 to 1982-83	1982-83 to 1983-84	Total
TOTAL READING	430	71.5	71.3	70.6	-0.2	-0.7	-0.9
Vocabulary	70	70.1	69.9	69.5	-0.2	-0.4	-0.6
Prefixes, roots, and suffixes	16	67.0	66.8	66.8	-0.2	-0-	-0.2
Recognizing word meanings	37	67.7	67.7	67.1	-0-	-0.6	-0.6
Using context with multiple-meaning words	17	78.1	77.6	77.3	-0.5	-0.3	-0.8
Comprehension	330	71.2	71.0	70.1	-0.2	-0.9	-1.1
Literal	62	76.7	76.4	75.5	-0.3	-0.9	-1.2
Details	31	80.1	79.9	78.8	-0.2	-1.1	-1.3
--from single sentence	14	80.2	79.8	78.9	-0.4	-0.9	-1.3
--from two or three sentences	17	80.0	79.9	78.7	-0.1	-1.2	-1.3
Pronoun references	16	74.3	73.9	72.9	-0.4	-1.0	-1.4
Sequence	15	72.4	72.0	71.5	-0.4	-0.5	-0.9
Inferential	127	67.3	67.2	66.3	-0.1	-0.9	-1.0
Main idea	16	73.4	73.6	72.9	+0.2	-0.7	-0.5
Cause and effect	15	75.6	75.5	74.6	-0.1	-0.9	-1.0
Following organization	16	58.0	58.2	57.9	+0.2	-0.3	-0.1
Putting information together	15	62.5	62.1	60.9	-0.4	-1.2	-1.6
Predicting outcomes	18	69.3	68.7	68.0	-0.6	-0.7	-1.3
Making comparisons and contrasts	17	60.6	60.7	59.9	+0.1	-0.8	-0.7
Drawing conclusions from details	16	65.1	65.2	64.2	+0.1	-1.0	-0.9
Drawing conclusions from overall meaning	14	75.3	74.8	73.6	-0.5	-1.2	-1.7
Interpretive	79	74.9	74.6	73.5	-0.3	-1.1	-1.4
Analyzing characters	18	75.6	75.4	74.4	-0.2	-1.0	-1.2
Understanding setting	12	78.4	77.9	77.0	-0.5	-0.9	-1.4
Summarizing plot	13	73.4	73.2	72.0	-0.2	-1.2	-1.4
Understanding dialogue	12	77.2	77.3	76.0	+0.1	-1.3	-1.2
Sensing mood	12	67.1	66.4	65.3	-0.7	-1.1	-1.8
Understanding figurative language	12	77.4	77.1	75.8	-0.3	-1.3	-1.6
Critical/applicative	62	68.7	68.8	68.1	+0.1	-0.7	-0.6
Detecting author and author's attitude	12	66.1	66.2	65.1	+0.1	-1.1	-1.0
Detecting author's purpose	19	72.7	72.7	72.0	-0-	-0.7	-0.7
Separating fact from opinion	16	66.8	67.1	67.3	+0.3	+0.2	+0.5
Applications to a different context	15	67.9	67.6	66.5	-0.3	-1.1	-1.4
Study-locational skills	30	78.1	78.1	77.9	-0-	-0.2	-0.2
Reference materials and parts of a book	15	81.8	81.5	81.7	-0.3	+0.2	-0.1
Maps, graphs, and charts	15	74.2	74.6	74.2	+0.4	-0.4	-0-
Reading in the content areas							
Vocabulary--word meanings	37	67.7	67.7	67.1	-0-	-0.6	-0.6
In reading and literature	13	71.2	71.0	70.3	-0.2	-0.7	-0.9
In science	11	71.1	71.3	70.7	+0.2	-0.6	-0.4
In social studies	13	61.3	61.4	60.9	+0.1	-0.5	-0.4
Comprehension of literature passages	117	74.3	74.0	72.9	-0.3	-1.1	-1.4
Literal	17	79.5	78.7	77.7	-0.8	-1.0	-1.8
Inferential	29	72.0	71.9	70.8	-0.1	-1.1	-1.2
Interpretive	61	74.7	74.4	73.3	-0.3	-1.1	-1.4
Critical/applicative	10	69.9	69.8	68.8	-0.1	-1.0	-1.1
Comprehension of science passages	103	68.0	68.0	67.3	-0-	-0.7	-0.7
Literal	17	76.5	76.6	75.7	+0.1	-0.9	-0.8
Inferential	58	65.4	65.2	64.5	-0.2	-0.7	-0.9
Critical/applicative	28	68.4	68.5	68.1	+0.1	-0.4	-0.3
Comprehension of social studies passages	107	70.8	70.7	69.8	-0.1	-0.9	-1.0
Literal	28	75.2	75.0	74.0	-0.2	-1.0	-1.2
Inferential	40	66.7	66.6	65.8	-0.1	-0.8	-0.9
Interpretive	15	77.0	77.0	75.6	-0-	-1.4	-1.4
Critical/applicative	24	68.7	68.7	67.9	-0-	-0.8	-0.8

Table 4

Reading Scores of California Eighth Grade Students on the Survey of Academic Skills: Grade 8, 1983-84

Skill area	Number of questions	Average percent correct score 1983-84
TOTAL READING	396	64.8
Vocabulary	83	64.5
Prefixes, roots, and suffixes	15	56.8
Word meaning	51	63.5
Using context	17	74.0
Comprehension	277	65.3
Literal	44	72.0
Details	14	75.0
Pronoun reference	15	69.9
Sequence	15	71.2
Inferential	96	65.3
Main idea	16	67.6
Cause and effect	16	66.4
Following organization	16	68.5
Predicting outcome	15	69.4
Compare and contrast	17	56.6
Drawing conclusions	16	63.5
Interpretive	62	64.4
Analyzing character	15	69.8
Understanding plot, setting, dialogue	16	68.5
Sensing mood	15	66.5
Recognizing literary type	16	53.2
Critical/applicative	75	62.1
Author, author's attitude, author's purpose	14	65.3
Separating fact, opinion, hypothesis	15	60.9
Justifying inference	15	56.2
Formulating critical questions	15	57.7
Applications to another context	16	70.2
Study-locational skills	36	61.3
Reference and dictionary skills	16	58.5
Graphs and charts	20	65.3

Table 4 (continued)

Skill area	Number of questions	Average percent correct score 1983-84
Reading in the content areas		
Word meanings	51	63.5
In reading and literature	14	66.0
In science	17	60.1
In social studies	20	64.8
Comprehension of literature passages	88	67.0
Literal	13	78.6
Inferential	16	70.1
Interpretive	44	65.0
Critical/applicative	15	59.4
Comprehension of science passages	89	62.3
Literal	16	62.2
Inferential	44	63.9
Critical/applicative	29	59.8
Comprehension of social studies passages	96	67.4
Literal	15	76.8
Inferential	34	65.3
Interpretive	16	66.6
Critical/applicative	31	65.6

Table 5

Reading Scores of California Twelfth Grade Students on the Survey of Basic Skills: Grade 12, 1975-76 Through 1983-84

	Skill area					
				Comprehension		
	Total reading	Vocab-ulary	Compre-hension	Literal	Inter-pretive/ critical	Study/ locational
Number of questions	141	31	97	47	50	13
	Average percent correct score					
1975-76	64.1	61.3	64.5	69.2	60.1	68.4
1976-77	63.6	60.9	63.9	68.9	59.3	67.2
1977-78	63.3	60.5	63.7	68.5	59.2	67.3
1978-79	63.2	60.2	63.7	68.6	59.0	67.4
1979-80	63.1	60.0	63.5	68.5	58.9	67.4
1980-81	63.4	60.2	63.8	68.8	59.1	68.4
1981-82	63.2	60.1	63.5	68.6	58.8	68.2
1982-83	63.1	60.0	63.4	68.3	58.7	68.3
1983-84	62.2	59.5	62.3	67.0	57.9	68.1
	Change in average percent correct score					
1975-76 to 1976-77	-0.5	-0.4	-0.6	-0.3	-0.8	-1.2
1976-77 to 1977-78	-0.3	-0.4	-0.2	-0.4	-0.1	+0.1
1977-78 to 1978-79	-0.1	-0.3	-0-	+0.1	-0.2	+0.1
1978-79 to 1979-80	-0.1	-0.2	-0.2	-0.1	-0.1	-0-
1979-80 to 1980-81	+0.3	+0.2	+0.3	+0.3	+0.2	+1.0
1980-81 to 1981-82	-0.2	-0.1	-0.3	-0.2	-0.3	-0.2
1981-82 to 1982-83	-0.1	-0.1	-0.1	-0.3	-0.1	+0.1
1982-83 to 1983-84	-0.9	-0.5	-1.1	-1.3	-0.8	-0.2
Total change, 1975-76 to 1983-84	-1.9	-1.8	-2.2	-2.2	-2.2	-0.3

Dr. Chall has proposed a six-stage theory of reading development. According to this theory, stage 1 is the "initial reading and decoding stage." In this stage learners internalize knowledge about reading, such as how to know that "cat" is not "can" and how to know when they make a mistake. In stage 2 students consolidate what they have learned earlier by reading about things that are familiar. They gain fluency by reading familiar stories and, in doing so, prepare themselves to acquire new information in the next stage that begins at about grade four.

The Survey of Basic Skills: Grade 3 is administered near the end of the third grade just at the time that many students are mastering the second stage of reading development, according to Dr. Chall's theory. The third grade CAP reading test consists primarily of comprehension and vocabulary questions that are based on very familiar types of reading passages, which are selected, among other reasons, for their appeal to third graders.

It would appear evident from Table 2 that the great majority of California's children have mastered the rudiments of word identification by the end of the third grade and that a majority, nearly 75 percent, can successfully recognize the main idea of a simple, familiar type of story, such as the following example:

The littlest pine tree in the woods was unhappy because it wanted golden leaves instead of needles. "That would make me the most beautiful tree in the forest," it kept saying.

One night, the wood fairy granted its wish. "Now I shall always be happy," cried the little tree. But the next day, a man came along and picked them all off.

"How foolish," said the tree. "Glass leaves would be as pretty but no one would pick them." In the morning, the tree's wish had been granted again. Then a wind storm came and broke all the glass leaves.

The little tree cried, "I shouldn't have wished to be better than the other trees. I would be so happy to have green leaves."

The next morning, the little tree awoke covered with green leaves. What a happy morning! But a goat came and ate all the leaves off.

"How foolish I have been," sobbed the little tree. "Needles are best after all. I wish I could have them back again."

The next morning, the little tree had its own long green needles and it never wished for leaves of any kind again.

This story is mostly about

- o *a goat who was hungry for leaves.*
- o *a fairy who liked leaves on trees.*
- o *a man who was hunting for gold.*
- • *a tree who wanted to be the most beautiful.*

Scores

1979-80	*1980-81*	*1981-82*	*1982-83*	*1983-84*
78.7	*79.7*	*80.3*	*82.3*	*83.7*

Moreover, California's third graders have been performing more successfully every year for the past 17 years on tasks of this nature.

The reading committee also stressed that a variety of oral language activities undergird instruction in beginning reading, a viewpoint that is affirmed in the Reading Framework for California Public Schools:

> Language is the heart of the educational process; therefore, success in all aspects of language arts is dependent upon the development and extension of the skills in oral language.

Some researchers view learning to read as learning to convert graphic symbols into speech so that the familiar processes of using and understanding speech can be applied to written language. This concept of reading skills acquisition contains, virtually by definition, a statement of the paramount importance of oral language facility as the basis of early reading instruction.

Grade Six

At grade six reading scores declined by 0.7 percent correct, marking the second year of declining scores in reading achievement at this grade level. Members of the Reading Assessment Advisory Committee analyzed the sixth grade results in depth because the decline in reading achievement was inconsistent with the sixth grade gains in written expression and mathematics as well as with the 17-year trend of improving reading scores at grade three. The committee examined the reading results in relation to changes in the background characteristics of the sixth grade population.

They speculated that the decline in reading scores might be associated with shifts in the socioeconomic status or English language fluency of the sixth grade population. From Table 6 the committee observed that there has been a trend in the last few years toward a slight lowering of the overall socioeconomic status of the sixth grade population. However, this fact does not fully account for the decline in reading scores. Sixth grade mathematics and written expression scores improved overall and the third grade reading scores improved as well, even though there is an even greater decline in socioeconomic status at grade 3.

Table 6

Percent of Sixth Grade Students, by Socioeconomic Status (Parents' Occupation), 1978-79 Through 1983-84

Parents' occupation	Percent of students					
	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Executive, professional, manager	14.0	15.2	15.7	16.5	15.5	15.1
Semiprofessional	17.1	19.1	19.6	19.4	18.4	17.8
TOTAL	31.1	34.3	35.3	35.9	33.9	32.9
Skilled, semiskilled	32.5	34.1	34.2	36.7	37.2	37.6
Unskilled	15.0	15.9	16.6	18.1	20.8	21.6
Unknown	6.3	6.4	6.4	6.0	5.3	5.3
TOTAL	21.3	22.3	23.0	24.1	26.1	26.9
No response	15.1	9.2	7.6	3.4	2.8	2.6

The committee also suggested investigating the changes in scores of the limited-English and fluent-English groups within the sixth grade population. This analysis (Table 7) showed that the limited-English- and fluent-English-speaking students, in fact, showed gains in their reading scores from 1982-83 to 1983-84 (0.7 percent correct), while the English-only students' scores declined (-0.6 percent correct).

Thus, the committee's hypothesis that a shift in California's population might account for the slippage in reading achievement was not fully supported by the data. However, the committee was concerned about the substantial increase in time sixth graders reported watching television (39 minutes a day) and by the decline in sixth grade students' attitudes toward reading (see "Reading, Homework, and Television Viewing Habits" in this chapter and "Attitudes Toward Writing as Compared to Reading" in Chapter IV). Committee members commented that students do not usually "learn" from the electronic media by questioning, analyzing, or reflecting. Instead, they gain information and sensation by absorbing--quite the opposite of how learning comes through school. One committee member suggested that students may spend less time learning to think and study and more time simply absorbing and feeling. This concern, however, was not fully substantiated by the data either; sixth graders reported spending more time doing homework and slightly more time reading for pleasure in addition to watching more television since 1979-80.

Table 7

Percent of Students and Percent Correct Reading Scores,
By English Fluency and Language Spoken, 1977-78 Through 1983-84
Grade Six

English language fluency and other languages spoken	Percent of students							Reading scores: Average scores							Reading scores: Changes				
	1977-1978	1978-1979	1979-1980	1980-1981	1981-1982	1982-1983	1983-1984	1977-1978	1978-1979	1979-1980	1980-1981	1981-1982	1982-1983	1983-1984	'77-78 to '78-79	'78-79 to '79-80	'79-80 to '80-81	'81-82 to '82-83	'82-83 to '83-84
State total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	66.3	66.8	67.5	68.0	71.5	71.3	70.6	+0.5	+0.7	+0.5	-0.2	-0.7
English only	74.5	73.3	73.1	72.5	*	72.4	70.2	68.6	69.4	70.2	70.7	*	74.4	73.8	+0.8	+0.8	+0.5	*	-0.6
Fluent English, total	14.6	15.8	16.4	17.3		19.5	20.8	59.6	60.9	61.3	62.0		65.8	66.2	+1.3	+0.4	+0.7		+0.4
Chinese	0.6	0.7	0.6	0.7		0.8	1.0	75.5	76.3	77.1	77.6		80.7	80.3	+0.8	+0.8	+0.5		-0.4
Japanese	0.3	0.3	0.3	0.3		0.2	0.3	78.0	78.7	78.8	78.9		82.4	81.4	+0.7	+0.1	+0.1		-1.0
Philippine dialects	0.7	0.7	0.8	0.8		0.9	0.9	67.8	68.6	68.7	69.8		75.6	75.2	+0.8	+0.1	+1.1		-0.4
Spanish	10.7	11.3	11.8	12.3		13.7	14.4	56.3	57.3	57.8	58.4		62.4	62.4	+1.0	+0.5	+0.6		-0-
Vietnamese	--	--	0.3	0.4		0.5	0.7	--	--	69.4	70.4		73.2	75.8	--	--	+1.0		+2.6
Korean	--	--	0.3	0.4		0.5	0.5	--	--	75.9	75.3		80.7	82.7	--	--	-0.6		+2.0
Other	2.0	2.4	2.0	2.1		1.8	2.0	66.7	68.4	66.8	68.8		72.6	71.9	+1.7	-2.0	+2.0		-0.7
No response	0.3	0.3	0.3	0.3		1.1	0.9	--	--	--	--		--	--	--	--	--		--
Limited English, total	3.7	4.4	4.1	4.0		5.1	5.9	39.2	40.1	42.0	41.8		46.8	47.5	+0.9	+1.9	-0.2		+0.7
Chinese	0.1	0.2	0.2	0.2		0.3	0.4	44.4	48.2	50.8	43.4		50.1	52.1	+3.8	+2.6	-7.4		+2.0
Japanese	a	a	a	a		a	a	44.8	59.2	52.2	55.5		61.1	59.3	+4.1	-0.7	+0.3		-1.8
Philippine dialects	0.1	0.1	0.1	0.1		0.1	0.2	49.5	57.6	49.9	49.6		55.0	52.2	+1.9	+2.3	-0.3		-2.8
Spanish	2.9	3.3	3.1	2.9		3.3	3.8	37.9	38.8	40.5	41.0		45.9	46.5	+0.9	+1.7	+0.5		+0.6
Vietnamese	--	--	0.2	0.2		0.4	0.5	--	--	43.7	39.5		47.5	50.0	--	--	-4.2		+2.5
Korean	--	--	0.1	0.1		0.1	0.1	--	--	49.8	51.3		56.3	55.4	--	--	+1.5		-0.9
Other	0.4	0.6	0.3	0.4		0.6	0.7	43.5	42.8	43.8	41.9		43.9	44.7	-0.7	+1.5	-1.9		+0.8
No response	0.1	0.1	0.1	0.1		0.2	0.1	--	--	--	--		--	--	--	--	--		--
Non-English-speaking	0.9	1.2	1.9	2.3				--	--	--	--		--	--	--	--	--		--
No response	6.3	5.4	4.5	4.0		3.1	3.1	--	--	--	--		--	--	--	--	--		--

NOTE: "a" value = <.05%

*Test changed in 1981-82

Members of the committee concluded that it would be more useful to interpret the sixth grade decline in reading scores developmentally in terms of curriculum and instruction as reflected by the CAP tests. Before the fourth grade most students are mastering the fundamentals of reading and are often restricted by limited vocabulary and fluency to reading about familiar subjects. As discussed above, the third grade CAP test includes a range of passages that are designed to be representative of that body of familiar, high-interest reading material.

In the fourth, fifth, and sixth grades, teachers' expectations about what children must read begin to change. Demands are placed on children to begin reading unfamiliar words and longer, more complex sentences. As is stated in the Reading Framework for California Public Schools, the emphasis shifts from "learning to read" to "reading to learn," i.e., children must begin using their reading skills to learn subjects such as history and science. According to Dr. Chall's theory of development, reading to gain new information marks stage 3 and continues through grade 8. Heavier demands are placed on students to cope with a greater number of words as well as more difficult and abstract vocabulary, to deal increasingly with abstractions, to make more inferences about what is not obviously stated in texts, to make critical judgments, and to apply what they have read to new and different contexts. Members of the reading committee believe that such higher-order reading/thinking abilities should be a central focus of reading instruction. Consequently, the reading section of the Survey of Basic Skills: Grade 6 (introduced in 1982) emphasizes a broad range of higher-order comprehension skills included under the areas of inferential, interpretive, and critical/applicative comprehension.

To make the shift from primary instructional materials to the increased demand for higher-order reading/thinking skills at the intermediate grades, students need strong instructional support. Members of the reading committee have observed, however, that reading support services are often focused on the primary grades and tend to drop off at grades four, five, and six.

Some researchers have contended that the root of the problem may be found by examining the instructional practices of classroom teachers. As reported in Education Week, September 5, 1984, one prominent researcher found that comprehension instruction, needed at all elementary levels, does not really occur at all:

> In a pivotal study of classroom practice, conducted in 1978-79, Dolores Durkin, professor of education at the University of Illinois and a senior scientist with the university's Center for the Study of Reading, observed nearly 18,000 minutes of reading and social studies lessons in grades 3 through 6. She concluded that teachers spent less than 1 percent of that time explicitly helping children understand what they read beyond the definition of individual words.
>
> The bulk of time, she learned, was spent asking children questions to test what they already knew and understood and assigning children worksheets to provide practice on specific skills. In addition, most of the questions focused on a child's providing a single correct answer by repeating a detail that was explicitly stated in the text. For example, if the text read, "John threw the ball," the child was asked, "Who threw the ball?"

To understand why this was happening, Ms. Durkin studied the suggestions in the teacher's manuals accompanying basal-reading programs--the basic language-arts textbooks used in grades kindergarten through 6. These readers account for more than 95 percent of the content of elementary school reading lessons, according to Ms. Durkin.

She found that the manuals reflected what was happening in the classroom. They provided simple questions with single correct answers to test students' knowledge of what they had read, and worksheets and workbook pages for students to complete independently. Only rarely did the guides instruct the teacher to help the child understand something. These instructions were often limited to one sentence, such as "remind the students that the main idea is the most important idea in the paragraph."

The assumption of the manuals, Ms. Durkin concludes, appeared to be that children would learn by osmosis. Teachers and textbook writers apparently hoped, she says, that by practicing comprehension skills on "ditto sheets," children would eventually gain the ability to read for meaning on their own.

"It's only recently . . . that we have been trying to make a distinction between assessing comprehension and actually instructing children in how to comprehend," she notes.

Richard Anderson, Co-director of the University of Illinois's Center for the Study of Reading, was quoted in the same issue of Education Week as reinforcing Durkin's position:

What we see a great deal of--and people who've been around in the field for many years tell me more of it than we saw in the past--is children in every area of the school curriculum, but notably in reading, spending extraordinary amounts of time on "seat work" exercises that are supposed to provide practice on some small, bitter piece of reading.

"Seat work" refers to the array of workbooks, worksheets, and materials run off by teachers that accompany most language arts textbooks in grades kindergarten through 6. Children typically work on these handouts alone at their desks--filling in blanks, circling multiple-choice responses, and answering questions with a word or a phrase.

Very few of these exercises entail comprehension. That is, they do not require drawing inferences, using analogy. They tend to be drills on more molecular pieces of reading--in the early grades, syllabification, diacritical marking, aspects of phonics. Quantitative estimates are that in the typical classroom, from 30 to 70 percent of classroom time during the reading period is spent on such seat work. That's not contributing very much to the development of higher-order reasoning, thinking, and comprehension abilities.

The concern about undue emphasis being placed on the more "molecular" pieces of reading in elementary instruction is substantiated by the considerable increases in structural analysis scores at grade three (4.7 percent correct) and by the comparatively lesser declines in prefixes, roots, and suffixes (-0.6 percent correct) and study-location skills (-0.2 percent correct) than in the comprehension skills (-1.1 percent correct) at grade six.

Members of the CAP reading committee have recommended that teachers rely more heavily on student-centered approaches to teaching reading comprehension that require more active dialogue between teachers and students as well as open-ended writing exercises and less on the use of work sheets and workbooks that involve multiple-choice and fill-in-the-blank formats.

Not only does the current sixth grade CAP test cover a broader range of higher-order reading skills than does the third grade test, but it also goes beyond the familiar, high-interest reading materials of the third grade test to include a broad array of selections from science, social studies, and literature. This shift is consistent with the Reading Framework for California Public Schools, which stresses reading in the content areas and the shift in elementary school from learning to read to reading to learn.

Members of the reading committee observed several indications of weakness with respect to literature. For example, they noted from the data in Table 3 that the greatest cumulative losses have occurred in the comprehension of literature passages (-1.4 percent correct). The committee also noticed that the percentage of students recognizing the meaning of literature-related terms, such as "myth" and "folk tale," declined (approximately 2 percent and 1 percent, respectively); on the other hand, 1 percent more students recognized the meaning of the word "phrase." These changes led the committee members to speculate that more instructional attention is being devoted to skills and less to the study of different types of literature. In any event they concluded that high-quality literature must be the core of elementary reading instruction.

Grade Eight

The new Survey of Academic Skills: Grade 8 was similar to that of the Survey of Basic Skills: Grade 6. The reading passages were derived from traditional science, social studies, and literary materials. The comprehension skills cover a similar range of higher-order reading/thinking skills, including a few new skill elements, such as recognizing literary types and devices; justifying inferences; formulating critical questions; and separating facts from opinions, hypotheses, laws, value judgments, etc.

The new eighth grade test is harder for eighth graders (the mean reading score was 64.8 percent correct) than is the sixth grade test for sixth graders (mean score, 70.6 percent correct). Members of the reading committee observed that eighth grade students had the least difficulty on items in which the answer was explicitly embedded within the text: literal details (75.0 percent correct); pronoun references (69.9 percent correct); sequence (71.2 percent correct); and using context (74.0 percent correct). Lower scores occurred on skills involving some degree of outside knowledge: prefixes, roots, and suffixes (56.8 percent correct); comparison and contrast (56.6 percent correct); recognizing literacy types and devices (53.2 percent correct); separating fact, opinion, hypotheses, laws, etc. (60.9 percent correct); and reference and dictionary skills (58.5 percent correct). Word meanings in science presented more difficulty for students than word meanings in the other content areas.

Eighth graders also seemed to encounter difficulty with items requiring them to justify inferences and formulate critical questions. Members of the committee commented that students may be unfamiliar with higher-order questions of this nature. The committee also observed that students encountered difficulty on questions that required them to comprehend more than a sentence or whole paragraph. The students appeared to grasp only partial meanings perhaps because they neglected to read the question carefully or because they didn't read the entire passage. As was the case at the sixth grade, eighth grade students encountered more difficulty in the comprehension of the science passages than they did with the comprehension skills based on the social studies and literature passages.

Many studies have shown that prior knowledge is strongly correlated with reading comprehension. Some researchers have concluded that many problems in reading comprehension may be traceable to deficiencies in knowledge rather than in any narrowly defined reading skill. Dr. Chall asserts that in stage 3 (from fourth grade through the eighth grade) as well as in more advanced stages, children's prior knowledge of a subject is the key to how much they understand what they read. According to Dr. Chall, background knowledge needed for reading is reflected in children's vocabulary growth (Education Week, September 5, 1984).

According to Richard Anderson and other researchers, teachers can help provide students with background knowledge prior to reading, both through the systematic teaching of vocabulary that is central to the concepts to be learned and through what is called "directed instruction." "When the children are to sit down to read a story," explains Mr. Anderson, "you need to rather self-consciously draw out from them what they already know that relates to understanding the upcoming story, and, sometimes, you need to fill in what are quite probably gaps in their knowledge or points that will otherwise escape their attention. Second," Mr. Anderson says, "a teacher can provide direct explanation to children about what they do not know, pointing out to them, for instance, the meaning and use of signal words like because and therefore" (Education Week, September 5, 1984).

For the purpose of teaching children new material, many researchers suggest starting with what the children know about a general idea that is in the text and then building on that concept. For example, as cited in the same issue of Education Week, to prepare a group of junior high school students to read a chapter about the labor union movement in America, Harold L. Herber, Professor of Education at Syracuse University, had them recall everything they knew about "protest." Based on the idea of protest, he then taught students the concept of labor movements.

"Too often we have asked: 'What is it the children don't know and how can I get that into their heads?'" writes P. David Pearson, Professor of Education at the University of Illinois. "The better question is: 'What is it that the children do know that's enough like the new concepts so that I can use it as an anchor point?'"

Grade Twelve

The twelfth grade reading scores declined by another 0.9 percent correct in 1983-84, continuing a downward trend in California that has occurred for seven of the last eight years. The declines in total reading, vocabulary, and comprehension were the largest losses that have occurred on the Survey of Basic Skills: Grade 12 to date.

In the item-level analysis of the results, members of the committee observed that declines were not registered on all items. For example, a higher percentage of students (85 percent) recognized the meaning of "commission" in 1983-84 than in 1975-76 (83 percent). More dramatically, 72 percent of the students knew the meaning of "inevitable" in 1983-84 as compared to 61 percent in 1975-76. Likewise, a 4 percent gain was registered for the word "vertical" during the eight-year time span. Losses were apparent on some science-related vocabulary terms such as "friction" (81 percent correct in 1975-76 down to 80 percent correct in 1983-84); "telescope" (88 percent correct in 1975-76 down to 82 percent in 1983-84); "volume" (47 percent to 44 percent); and "substantiate" (75 percent to 69 percent). Members of the committee noted one pattern in the twelfth grade results similar to that found in the sixth grade analysis: scores improved on the language-related item "synonym" (from 72 to 74 percent over the eight-year time span) while scores decreased by 8 percent on the literary term "stanza" (from 64 percent to 56 percent). Members of the committee again speculated that many teachers may be stressing language skills at the expense of poetry and other literary forms.

Given the cumulative decline in reading scores since 1975-76, members of the reading committee pointed out the continuing need for reading and thinking skills to be taught in all curricular areas at the high school level. The committee's position is reinforced by many researchers and educators nationwide.

In his national study of 38 schools and more than 1,000 classrooms, John I. Goodlad found that with the exception of oral reading from common texts, reading accounted for only 6 percent of class time in elementary school, 3 percent in junior high, and 2 percent in high school. The problem is confounded at the secondary level, where subject matter specialists, such as teachers of history and science, expect their students to read but don't always know how to nurture reading abilities in a given content area.

"What is called teaching 'reading in the content areas,'" says Mr. Herber of Syracuse, "becomes a kind of thing that you do maybe once in a while with teachers who have some heightened awareness of how reading fits into the curriculum." He claims that while many subject area teachers know that reading "fits," most are not sure how. The result is that "reading instruction is abandoned" except in remedial education classes.

"It's the traditional view of reading," says Mr. Herber, "that it's something you learn, and once you learn it, it's sufficient for a lifetime." In fact, he argues, reading is a developmental process and reading skills must be constantly adapted to increasingly sophisticated materials and ideas. "Some people learn that by chance," says Mr. Herber. "Some don't learn it at all, and, as a consequence, they're not able to deal with those more sophisticated ideas because they have not learned how."

According to Dr. Chall's theory of reading development, high school reading involves dealing with more than one point of view and requires a more flexible mind set. Analyses of twelfth grade item data reveal that students sometimes seem to confuse the point of view taken by the author with that of a character in a story. The evidence suggests that even at the high school level many students would benefit from guided comprehension instruction.

After analyzing the reading results for grades three, six, eight, and twelve, the members of the committee created one set of recommendations for grade three and another set for grades six, eight, and twelve, both of which follow.

Instructional Recommendations for Grade Three

The members of the Reading Assessment Advisory Committee concluded their analysis of grade 3 test results by offering 4 instructional recommendations:

1. Research shows that students learn more and retain it longer when they have dialogue with the teacher and have many opportunities to write. Such teaching strategies should be employed much more frequently than assigning and correcting work sheets and workbooks.

2. Comprehension, especially the higher-level thinking skills and vocabulary, should be stressed in the primary grades without undue emphasis on the mechanics of word identification.

3. Every classroom should include numerous opportunities for oral language practice through discussions, reporting, and question-and-answer sessions.

4. Teachers should explore reasons for students' mistakes in an attempt to discover the thinking strategies the students are using.

5. Parents should encourage their children to discover the enjoyment of reading by:

   - o Reading aloud daily
   - o Creating a family reading time
   - o Visiting the public library
   - o Creating a family library
   - o Giving books and magazine subscriptions as gifts

Instructional Recommendations for Grades Six, Eight, and Twelve

After completing their analyses of the data from the CAP reading tests, the members of the committee offered the following recommendations for grades six, eight, and twelve:

1. Time for directed comprehension instruction must be increased, including time allotted for reading instruction, time spent reading, and time actively engaged in reading.

   Role of the student:

   Students must see the importance of "practice" in reading just as in any other skill (swimming, riding a bicycle, playing an instrument) and conscientiously spend time reading both in school and at home.

Role of the teacher:

Time scheduled for reading must not be encroached upon by other demands of the day. The time scheduled each day for language arts instruction also includes the other important skills of writing, speaking, and listening. They should be related to reading, not taken from the reading instructional time.

The teacher also needs to model reading and read aloud so that students hear the sound of enriched oral language.

Teachers need to be creative in "selling" reading, which is in competition for time with the growing electronic media. A reward system for the number of pages read is often helpful, particularly if parent cooperation has been secured.

Role of the administrator:

Schoolwide systems of rewards for outside reading have been successful if enthusiastically supported and organized by the administration.

Classroom time scheduled for reading should be adequately allotted and monitored with no interruptions permitted. Administrators need to understand and support the all-inclusive, yet developmental, nature of reading and the language arts.

Role of the parent:

Parents should create a regular time when the entire family reads for enjoyment to demonstrate the value of reading as an important and pleasurable habit.

2. Reading instruction must include a systematic literature program, including contemporary and classical selections of all genres and diverse cultures.

Role of the student:

The student should include a wide range of reading materials in his or her own reading. The teacher is the key to helping each student understand the wide range of materials available and necessary.

Role of the teacher:

The time spent on systematic instruction in reading must include a wide range and depth of literature materials, giving students a greater understanding of our literary heritage and their lives in it. This exposure should be enhanced through listening, discussion, and writing. It should include all genres--poetry, narrative and expository writing, story telling, folklore, fiction and nonfiction, biography and historical fiction, science, science fiction, etc.

Role of the administrator:

It cannot be assumed that all students have the literary heritage that would enable them to understand the references and nuances in written English. This includes the English-proficient as well as the increasing numbers of limited-English-proficient students entering California's schools. Curriculum planning must include a wide range of classical and contemporary literature, and enough time in the program for appropriate instruction in them.

Role of the parent:

Parents need to involve their children with different types of literature, including fiction and nonfiction, classical as well as contemporary literature, and various poetry forms.

3. Science teachers, as well as other content area teachers, should assume responsibility for promoting reading/thinking skills in their content areas.

Role of the student:

The student should learn to recognize differences among various kinds of text in different content areas and should adjust his or her reading rate and attention to the demands of the text.

Role of the teacher:

The teacher should support students in their reading of content area texts by teaching key concepts prior to reading assignments, by setting the stage for comprehension with questions that will help students make predictions and relate new information to what they already know, and by asking follow-up questions that go beyond facts to inferences and applications to other contexts.

Role of the administrator:

The principal should take steps to ensure that content area teachers are working departmentally to enhance reading/thinking skills.

4. Reading comprehension, including the higher-level thinking skills, must be actively and creatively taught in all content areas and must go beyond merely assigning and correcting work sheets and workbooks. A good reading program is not just texts and workbooks, but library books and oral and written responses to reading that include much more than one-word answers.

Role of the student:

Students should assume an active role when reading for class assignments by asking questions and clarifying what they do not understand.

Role of the teacher:

Teachers must search out and assign reading that reaches for the higher-level thinking skills. Workbooks and dittoed material should be used sparingly. Students should often have blank paper on which to organize their own ideas and write questions without a predetermined answer for discussion stimulation and mental stretching.

Role of the administrator:

The principal and district administrators should search out the best of the in-service opportunities and make the resources available for utilizing them. Textbook ordering must be done in light of the ways in which the material is to be used.

Role of the parent:

Parents need to talk with their children, asking questions that elicit reactions to stories and encouraging them to keep asking their own questions.

5. Reading skills involving inferential and interpretive comprehension (particularly in the areas of putting information together, drawing conclusions from overall meaning, sensing the mood of a passage or poem, and understanding figurative language) need more emphasis in all reading programs.

Role of the student:

The student must actively engage himself or herself in the act of reading, to think about the author's techniques of persuasion and expression, to ask questions of and/or picture what is being read, and to compare it with other information.

Role of the teacher:

Teachers should take time to help children understand the mood of a selection, the figurative language involved, and the deeper meanings of a literary selection.

Role of the administrator:

The principal, district administrators, and reading specialists should communicate with teachers the need to teach the full range of comprehension skills, including those unique to literature.

Role of the parent:

Parents should have their children relate books, stories, and other printed material to movies, television programs, and plays. They should challenge their children to compare and contrast the different experiences in terms of mood, characters, and ideas.

6. Vocabulary instruction in a meaningful context should receive a high priority, actively engaging students with words in all content areas, with emphasis on both their technical and figurative meanings.

Role of the student:

Students should constantly be aware of new words and the context in which they appear. Students should be aware of core vocabulary words that are specific to content areas, such as science, mathematics, literature, and social studies.

Role of the teacher:

Through a variety of techniques, teachers should aid students in increasing their reading and spoken vocabulary, including the meaning and nuance of each term.

Role of the administrator:

Administrators should take steps to ensure that vocabulary is a central component of instruction in all curricular areas.

Role of the parent:

Parents can help extend their children's vocabularies through a variety of enriching experiences, such as games, hobbies, and sports.

Reading, Homework, and Television Viewing Habits

The Reading Framework for California Public Schools (1980) sets forth a model for a developmental reading program involving three levels: (1) learning to read; (2) reading to learn; and (3) reading for life. Personal reading is illustrated as an important part of the reading program and is presented in a major component of reading for life, as stated below:

> The teaching of reading must go beyond the process of decoding and comprehension; students also must be shown and taught the rewards of personal reading through the example of adult models. Personal reading might include recreational reading, reading for fun, reading classified ads to secure a job, or reading a "how-to" manual. Conscious efforts should be made by both schools and parents to associate reading with personal needs. Students should develop skills for choosing reading materials and for scheduling times and places for personal reading. These skills will strengthen as time passes, so that personal reading becomes a major component of reading for life.

(Reading Framework for California Public Schools, Sacramento: California State Department of Education, 1980, p. 18.)

In order to determine how successfully California's schools are realizing this goal, the Department of Education surveyed sixth, eighth, and twelfth graders in 1983-84 on their independent reading habits. Parallel questions

on television viewing were also included for purposes of comparison. These questions were also administered in 1979-80 at grades six and twelve.

The questions in Figure 1 appeared on the back of each test booklet at the respective grade levels:

Grades 6 and 8

TIME READING AND WATCHING TV

On a typical weekday, approximately how many hours do you spend:

	Number of Hours							
	0	½-½	½-1	1-2	2-3	3-4	4-5	5+
Reading for pleasure	○	○	○	○	○	○	○	○
Watching TV	○	○	○	○	○	○	○	○

Grade 6

TIME ON HOMEWORK

On a typical weekday, how much time do you usually spend **outside school** doing homework?

- ○ None Assigned
- ○ None
- ○ Less than ½ hr.
- ○ ½ to 1 hr.
- ○ 1 to 2 hr.
- ○ More than 2 hr.

Grade 12

Fig. 1. Reading, homework, and television survey questions used in conjunction with CAP tests, 1983-84

The sixth grade results of the survey questions on reading for pleasure, television viewing, and homework for 1979-80 and for 1983-84 are shown in tables 8, 9, and 10.

Table 8

Reading Scores of Sixth Grade Students, by Time Spent Reading for Enjoyment/Pleasure, 1979-80 and 1983-84

Time spent reading for enjoyment/pleasure	Percent of students		Reading scores
	1979-80	1983-84	1983-84
Total reading	100	100	70.6
0-1 hours	64	65	70.0
1-2	24	21	73.2
2-3	8	8	75.0
3-4	2	3	74.5
Over 4	2	3	73.7

Average time reading: In 1979-80, 62 minutes per day; in 1983-84, 64 minutes per day

Table 9

Reading Scores of Sixth Grade Students, by Time Spent Watching Television, 1979-80 and 1983-84

Time spent watching TV	Percent of students		Reading scores
	1979-80	1983-84	1983-84
Total reading	100	100	70.6
0-1 hours	28	13	73.3
1-2	23	17	73.1
2-3	17	20	73.1
3-4	11	18	72.1
Over 4	21	32	68.2

Average time reading: In 1979-80, 2 hours, 14 minutes per day; in 1983-84, 2 hours, 53 minutes per day

Table 10

Reading Scores of Sixth Grade Students, by Time Spent on Homework, 1979-80 and 1983-84

Amount of homework	Percent of students		Reading scores
	1979-80	1983-84	1983-84
No homework	27	1	68.0
Did not do	8	2	63.5
Less than 1 hour	39	60	70.9
1-2 hours	21	29	72.6
Over 2	5	8	70.1

Average time: In 1979-80, 30 minutes per day; in 1983-84, 47 minutes per day

The following conclusions are evident from tables 8, 9, and 10:

- Very little change occurred from 1979-80 to 1983-84 in the amount of time sixth graders reported reading for pleasure. The typical sixth grader in 1983-84 reported spending 64 minutes a day reading for pleasure as compared to 62 minutes a day reported by the typical sixth grader in 1979-80.

- There has been a substantial increase from 1979-80 to 1983-84 in the amount of time sixth graders reported that they spend watching television. The typical sixth grader in 1983-84 reported watching television two hours and 53 minutes a day--39 minutes more than that reported in 1979-80.

- The typical sixth grade student in 1983-84 reported spending 47 minutes a day doing homework--17 minutes more than that reported in 1979-80.

- In 1983-84 only one percent of the sixth graders reported that they were not assigned any homework on a typical weekday--compared to 27 percent in 1979-80.

- At the sixth grade the highest reading scores were associated with lesser amounts of television watching and greater amounts of time spent reading for pleasure and doing homework.

The eighth grade results of the survey questions on reading for pleasure and television viewing for 1983-84 are shown in tables 11 and 12.

Table 11

Reading Scores of Eighth Grade Students, by Time Spent Reading for Pleasure, 1983-84

Time spent reading for pleasure	Percent of students	Reading scores
Total reading	100	64.8
0 hours	12	58.2
0-1/2	27	64.1
1/2-1	31	65.4
1-2	18	67.3
2-3	7	68.5
3-4	3	68.9
4-5	1	68.3
Over 5	1	69.1

Average time: 57 minutes per day

Table 12

Reading Scores of Eighth Grade Students, by Time Spent Watching Television, 1983-84

Time spent watching TV	Percent of students	Reading scores
Total	100	64.8
0 hours	2	68.7
0-1/2	4	67.9
1/2-1	8	67.5
1-2	18	67.5
2-3	20	66.3
3-4	17	65.0
4-5	12	63.9
Over 5	19	59.6

Average time: 3 hours, 1 minute per day

Table 13

Reading, Language, and Mathematics Scores of Eighth Grade Students, by Time Spent on Homework, 1983-84

Amount of homework	Percent of students	Reading scores	Language scores	Mathematics scores
No homework	1	53.7	48.3	42.8
Did not do	3	55.7	49.5	46.4
1/2 hour or less	12	60.0	53.9	49.8
1/2-1 hour	42	64.2	58.3	53.7
1-2 hours	32	67.5	62.1	57.9
2 or more hours	10	67.7	62.8	59.3

Average time: 64 minutes per day

The following conclusions are evident from tables 11, 12, and 13 and from comparison with the sixth grade results:

- The typical eighth grader reported spending three hours and one minute watching television a day--8 minutes a day more than that reported by the sixth graders.
- The typical eighth grader reported spending 57 minutes a day reading for pleasure--slightly less than that reported by the sixth graders.
- The typical eighth grader reported spending 64 minutes a day doing homework--17 minutes a day more than that reported by the sixth graders.
- As was true for grade six, the higher eighth grade reading scores are associated with lesser amounts of television viewing and greater amounts of time spent reading for pleasure.

The twelfth grade results of the survey questions on reading and television viewing for 1979-80 and for 1983-84 are shown in tables 14 and 15.

Table 14

Reading Scores of Twelfth Grade Students, by Time Spent Reading for Enjoyment/Pleasure, 1979-80 and 1983-84

Time spent reading for enjoyment/pleasure	Percent of students		Reading scores
	1979-80	1983-84	1983-84
Total reading	100	100	62.2
0-1/2 hours	24	37	62.6
1/2-1	30	27	63.4
1-2	23	18	63.2
2-3	11	9	62.0
3-4	6	4	61.5
4-5	3	2	60.1
Over 5	3	3	60.8

Average time: In 1979-80, 1 hour, 25 minutes per day; in 1983-84, 1 hour, 10 minutes per day

Table 15

Reading Scores of Twelfth Grade Students, by Number of Hours Reading for Class Assignments and by Time Spent Watching Television, 1979-80 and 1983-84

Number of hours reading for class assignments	Percent of students		Reading scores
	1979-80	1983-84	1983-84
0-1/2 hours	18	19	61.4
1/2-1	30	32	62.8
1-2	26	28	63.4
2-3	14	12	63.0
3-4	7	5	62.0
4-5	3	2	60.3
Over 5	2	2	62.1

Average time: In 1979-80, 1 hour, 29 minutes per day; in 1983-84, 1 hour, 23 minutes per day

Time spent watching TV	Percent of students		Reading scores
	1979-80	1983-84	1983-84
Total	100	100	62.2
0-1/2 hours	14	18	65.9
1/2-1	16	19	64.1
1-2	22	23	63.5
2-3	19	17	61.6
3-4	13	0	59.5
4-5	7	5	58.5
Over 5	9	8	57.2

Average time: In 1979-80, 2 hours, 13 minutes per day; in 1983-84, 1 hour, 57 minutes per day

The following conclusions are evident from tables 14 and 15:

- The typical twelfth grader in 1983-84 spent less time reading for pleasure (by 15 minutes a day), less time reading for class assignments (by 6 minutes a day), and less time watching television (by 16 minutes a day) than did the typical twelfth grader in 1979-80.

- The typical twelfth grader in 1983-84 reported spending one hour and ten minutes reading for pleasure, one hour and twenty-three minutes reading for class assignments, and one hour and fifty-seven minutes watching television on a typical weekday.

- For twelfth graders the highest reading scores were achieved by those students who reported spending one-half to one hour a day reading for pleasure, one to two hours reading for class assignments, and one-half hour or less watching television.

In considering all the information collected by the California Assessment Program pertaining to reading, homework, and television viewing habits, members of the committee reflected on how these data might relate to declining reading test scores at grades six and twelve. They expressed particular concern over the increase in television viewing at grade six. Their concern was heightened by the parallel decline in student attitudes toward reading at this grade level (reported in the section entitled "Attitudes Toward Writing as Compared to Reading" in Chapter IV).

However, the committee was favorably impressed by the slight increase in time spent reading for pleasure and time spent doing homework at this grade level. Therefore, the data did not suggest that the increase in television viewing displaced reading and homework habits. Like the sixth graders, eighth graders reported watching television three times as much as reading for pleasure. Both groups reported, on the average, about three hours of television viewing compared to about one hour of pleasure reading a day.

In examining the twelfth grade data, the committee expressed concern over the decline in reading for pleasure (15 minutes a day) and in reading for class assignments (6 minutes a day) between 1979-80 and 1983-84. These declines in reading time could not be blamed on increases in television viewing time, because twelfth graders also reported a 16-minute decline in television watching. Members of the committee concluded that parents should encourage their children to compare and contrast what they read to what they see on television.

IV. Written Expression

Highlights of the results:

- Third and sixth grade written expression scores improved; twelfth grade scores declined; grade eight was tested for the first time.
- Sixth graders were better than last year at judging student writing and combining sentences but worse in language choices and paragraph skills.
- Eighth graders were strong in usage, capitalization, and punctuation but weak in identifying revisions that improve the effectiveness of expression, overall organization, and sentence structure.
- At grade twelve, the largest declines were in paragraphing and language choices.
- Students said they enjoy writing a little more at grade three and a great deal more at grade six than in previous years.
- Sixth and twelfth graders are doing more writing than they were three years ago.
- Seventy-five percent of the twelfth graders are taking four or more years of English--17 percent more than in 1979, but only 1 percent more than two years ago.

Also in this chapter:

- The written expression advisory committee's interpretation of written expression results for all grades
- A review of recent research on the teaching of writing as related to test scores
- The committee's policy and instructional recommendations for all grade levels

Written expression, in addition to reading and mathematics, was assessed in 1983-84 through CAP multiple-choice tests at grades three, six, eight, and twelve. The Survey of Basic Skills: Grade 3 was introduced in the spring of 1980, marking the first time that written language skills were assessed at grade three. The revised Survey of Basic Skills: Grade 6 replaced the earlier edition in the spring of 1982. The new Survey of Academic Skills: Grade 8 was implemented in the spring of 1984, the first year of grade eight assessment in California. The Survey of Basic Skills: Grade 12 is the oldest instrument used as part of the California Assessment Program (introduced in 1975-76) and is currently under revision to match the Model Curriculum Standards, Grades Nine Through Twelve.

Decisions concerning the emphasis and breadth of content for each of the CAP written expression tests were made by the English Language Assessment Advisory Committee, a panel of language arts specialists representing a cross section of instructional levels and institutions in the state (see the Appendix). The committee members attempted to reflect the goals and objectives stated in the English Language Framework for California Public Schools (Sacramento: California State Department of Education, 1976) and the Handbook for Planning an Effective Writing Program (Sacramento: California State Department of Education, 1983) in the development of the tests. The committee members also considered the following sources of information during the test development process for the CAP written expression tests:

- Content analyses of commonly used language textbooks adopted by the State Board of Education
- Reviews of skill area lists by teachers and curriculum specialists to indicate the degree of emphasis they assigned to each skill area
- Reviews of test items by teachers, who judged the degree of instructional emphasis placed on the skill measured by an item and suggested whether the item should be retained, modified, or omitted

All of the CAP written expression tests deal with skill areas that can be classified according to two main categories. The first, termed writing process skills by the committee, deals primarily with matters of judgment in writing. The skills in this category include paragraphing, sentence combining, making language choices, and judging student writing. The other category, termed supporting skills, comprises matters of correctness, including such skills as usage, punctuation, capitalization, and spelling.

In her "Statement on Criteria for Writing Proficiency" (1976), Mina Shaughnessy, author of Errors and Expectations, concisely maps out "two distinct territories of competence--choices and givens" that pertain to the assessment of writing and parallel the two categories--writing process skills (the choices) and supporting skills (the givens)--identified on the CAP test:

> One territory we can call the territory of choices, which is concerned with the quality of decisions a writer makes in the selection of words and sentence patterns and rhetorical strategies. The other territory we can call the territory of givens, which is concerned with correct forms. In the first territory a writer can be judged to be persuasive or unconvincing, interesting or dull, precise or imprecise, organized or disorganized, etc. In the second territory he is right or wrong, according to the conventions of the written code; that is, his grammar, his spelling, his punctuation, or his word choices will simply be perceived as right or wrong by the general reader.

(Notes from the National Testing Network in Writing, October 1982, page 14)

Written Expression Results

The results of third, sixth, eighth, and twelfth grade performance in written expression for 1983-84 are shown in tables 16, 17, 18, and 19. Year-to-year changes in overall performance and in skill area performance are also shown in the tables (except for Table 18, because the eighth grade Survey has been administered for only one year).

Grade Three

The third grade CAP written expression test consists of three skills judged by the committee as higher-order writing process skills (paragraphs, sentence recognition, and language choices) as well as an array of supporting language skills commonly taught during the primary grades. All the skills are assessed as discrete questions in the context of a simple sentence or a paragraph. The rationale for this testing format was to test every skill in a simple context to minimize the reading difficulty for third grade children as much as possible. The third grade test tends to be an easy test for third graders, as is evident from the average percent correct score.

Members of the English Language Assessment Advisory Committee were very pleased to see a gain of 1.1 percent correct from 1982-83 to 1983-84, marking the fourth consecutive year of gains since this test was first introduced and a total change of 4.0 percent correct from 1979-80 to 1983-84. They were also pleased to observe the consistent gains registered in all the skill elements assessed on the test and the sizable gains registered over time.

The committee members were especially gratified with the 2.1 percent correct gain in the recognition of details and sequence in paragraphs involving questions that require students to work with whole units of thought by selecting supporting details or sequential elements for a missing part in a given paragraph. The committee stressed that language instruction should focus on whole units of thought as much as possible rather than on pieces of language in isolation.

Table 16

Written Language Scores of California Third Grade Students on the Survey of Basic Skills: Grade 3, 1979-80 Through 1983-84

Skill area	Number of questions	Average percent correct score					Change in average percent correct score				Total change
		1979 to 1980	1980 to 1981	1981 to 1982	1982 to 1983	1983 to 1984	1979-80 to 1980-81	1980-81 to 1981-82	1981-82 to 1982-83	1982-83 to 1983-84	1979-80 to 1983-84
WRITTEN LANGUAGE, TOTAL	390	74.8	75.4	76.6	77.7	78.8	+0.6	+1.2	+1.1	+1.1	+4.0
Writing Process Skills											
Paragraphs	30	69.6	70.0	71.3	72.5	74.1	+0.4	+1.3	+1.2	+1.6	+4.5
Topic sentence	15	68.4	68.8	70.1	71.3	72.4	+0.4	+1.3	+1.2	+1.1	+4.0
Details and sequence	15	70.9	71.3	72.5	73.7	75.8	+0.4	+1.2	+1.2	+2.1	+4.9
Sentence recognition	75	78.4	79.1	80.5	81.8	82.8	+0.7	+1.4	+1.3	+1.0	+4.4
Statements and questions	15	74.1	74.9	76.1	77.6	78.7	+0.8	+1.2	+1.5	+1.1	+4.6
Complete sentences	60	79.5	80.2	81.7	82.8	83.8	+0.7	+1.5	+1.1	+1.0	+4.3
- Supplying subjects	30	78.8	79.5	80.8	83.6	84.7	+0.7	+1.3	+2.8	+1.1	+5.9
- Supplying verbs	30	80.3	80.9	82.5	82.0	82.9	+0.6	+1.6	-0.5	+0.9	+2.6
Language choices	30	66.1	67.0	68.6	69.9	70.8	+0.9	+1.6	+1.3	+0.9	+4.7
Sensory words	15	72.1	73.0	74.1	75.4	76.5	+0.9	+1.1	+1.3	+1.1	+4.4
Specific words	15	60.2	61.0	63.1	64.4	65.1	+0.8	+2.1	+1.3	+0.7	+4.9
Supporting Skills											
Standard usage	60	74.2	74.4	75.1	76.0	76.7	+0.2	+0.7	+0.9	+0.7	+2.5
Irregular verbs	15	76.7	76.6	77.3	78.1	78.7	-0.1	+0.7	+0.8	+0.6	+2.0
Pronouns	15	73.5	73.8	74.4	75.3	75.4	+0.3	+0.6	+0.9	+0.1	+1.9
Subject-verb agreement	16	69.3	69.5	70.4	71.1	72.6	+0.2	+0.9	+0.7	+1.5	+3.3
Noun determiners	14	78.0	78.5	78.9	80.0	80.7	+0.5	+0.4	+1.1	+0.7	+2.7
Word forms	66	74.9	75.2	76.0	77.1	78.3	+0.3	+0.8	+1.1	+1.2	+3.4
Prefixes	14	79.1	79.4	79.9	80.9	82.1	+0.3	+0.5	+1.0	+1.2	+3.0
Inflectional suffixes	12	76.3	76.6	78.0	79.1	80.3	+0.3	+1.4	+1.1	+1.2	+4.0
Derivational suffixes	11	76.3	76.8	77.3	78.1	78.9	+0.5	+0.5	+0.8	+0.8	+2.6
Irregular noun plurals	14	65.1	64.8	65.2	65.7	66.1	-0.3	+0.4	+0.5	+0.4	+1.0
Contractions	15	77.8	78.9	80.0	81.9	83.9	+1.1	+1.1	+1.9	+2.0	+6.1
Spelling	69	73.0	73.5	74.6	75.8	76.7	+0.5	+1.1	+1.2	+0.9	+3.7
Predictables	39	80.4	80.7	81.7	82.8	83.7	+0.3	+1.0	+1.1	+0.9	+3.3
Words with suffixes	16	55.5	56.3	57.5	58.9	60.1	+0.8	+1.2	+1.4	+1.2	+4.6
Demons and homophones	14	72.4	73.2	74.3	75.7	76.3	+0.8	+1.1	+1.4	+0.6	+3.9
Punctuation	30	72.0	73.3	74.9	76.8	78.6	+1.3	+1.6	+1.9	+1.8	+6.6
Periods and questions	10	77.8	79.0	80.8	82.6	83.6	+1.2	+1.8	+1.8	+1.0	+5.8
Commas	10	62.4	63.7	65.2	67.7	69.9	+1.3	+1.5	+2.5	+2.2	+7.5
Apostrophes	10	75.7	77.1	78.7	80.1	82.0	+1.4	+1.6	+1.4	+1.9	+6.3
Capitalization	30	88.1	89.2	90.1	91.1	92.0	+1.1	+0.9	+1.0	+0.9	+3.9
Persons	10	90.9	91.6	92.4	93.2	93.7	+0.7	+0.8	+0.8	+0.5	+2.8
Places	10	87.3	88.5	89.4	90.4	91.5	+1.2	+0.9	+1.0	+1.1	+4.2
Days/months	10	86.0	87.5	88.5	89.7	91.0	+1.5	+1.0	+1.2	+1.3	+5.0

Table 17

Written Language Scores of California Sixth Grade Students on the Survey of Basic Skills: Grade 6, 1981-82 Through 1983-84

Skill area	Number of questions	Average percent correct score			Change in average percent correct score		Total change
		1981-82	1982-83	1983-84	1981-82 to 1982-83	1982-83 to 1983-84	1981-82 to 1983-84
WRITTEN LANGUAGE, TOTAL	342	73.3	73.7	74.0	+0.4	+0.3	+0.7
Writing Process Skills	182	72.6	73.0	73.5	+0.4	+0.5	+0.9
Judging student writing	22	71.4	71.7	71.8	+0.3	+0.1	+0.4
Paragraphs	40	76.1	76.3	76.1	+0.2	-0.2	-0-
Topic sentences	10	74.2	74.7	74.1	+0.5	-0.6	-0.1
Details and sequence	10	77.0	77.6	77.5	+0.6	-0.1	+0.5
Outlines for organization	10	71.7	72.1	72.1	+0.4	-0-	+0.4
Consistency of verb and pronoun	10	81.6	81.0	80.8	-0.6	-0.2	-0.8
Sentence combining	50	66.8	67.9	69.6	+1.1	+1.7	+2.8
Simple sentences with modification	13	52.0	53.6	55.0	+1.6	+1.4	+3.0
Compound sentences and sentence parts	13	66.0	67.5	70.1	+1.5	+2.6	+4.1
Complex sentences	14	68.9	70.2	72.8	+1.3	+2.6	+3.9
Conjunctions	10	84.3	83.8	83.5	-0.5	-0.3	-0.8
Sentence recognition	40	75.2	75.6	75.9	+0.4	+0.3	+0.7
Supplying subjects	13	90.5	90.5	90.7	-0-	+0.2	+0.2
Supplying verbs	13	84.7	84.8	84.8	+0.1	-0-	+0.1
Forming complete sentences	14	52.1	53.3	53.9	+1.2	+0.6	+1.8
Language choices	30	75.0	74.7	74.3	-0.3	-0.4	-0.7
Sensory words	10	75.8	75.9	75.3	+0.1	-0.6	-0.5
Specific words and sentences	10	67.1	67.0	66.9	-0.1	-0.1	-0.2
Achieving tone through word choices	10	82.0	81.3	80.7	-0.7	-0.6	-1.3
Supporting Skills	160	74.1	74.5	74.6	+0.4	+0.1	+0.5
Standard usage	50	78.2	78.3	78.1	+0.1	-0.2	-0.1
Irregular verbs	10	77.5	77.7	78.0	+0.2	+0.3	+0.5
Pronouns	10	66.7	67.7	67.7	+1.0	-0-	+1.0
Subject-verb agreement	10	72.4	72.2	72.1	-0.2	-0.1	-0.3
Noun determiners	10	91.2	90.8	90.3	-0.4	-0.5	-0.9
Double negatives	10	83.0	82.8	82.4	-0.2	-0.4	-0.6
Word forms	32	74.6	74.9	75.3	+0.3	+0.4	+0.7
Suffixes	10	79.6	79.4	79.8	-0.2	+0.4	+0.2
Irregular noun plurals	10	71.3	71.5	71.6	+0.2	+0.1	+0.3
Contractions	12	73.2	74.0	74.7	+0.8	+0.7	+1.5
Spelling	50	71.2	71.7	71.7	+0.5	-0-	+0.5
Predictable words	15	73.2	74.0	74.4	+0.8	+0.4	+1.2
Words with suffixes	15	64.4	64.8	64.5	+0.4	-0.3	+0.1
Demons	10	76.8	77.1	76.6	+0.3	-0.5	-0.2
Homophones	10	72.9	73.2	73.6	+0.3	+0.4	+0.7
Capitalization and punctuation	28	71.5	72.3	72.9	+0.8	+0.6	+1.4
Capitalization	14	70.6	71.1	71.4	+0.5	+0.3	+0.8
Punctuation	14	72.4	73.6	74.5	+1.2	+0.9	+2.1

Table 18

Written Expression Scores of California Eighth Grade Students on the Survey of Academic Skills: Grade 8, 1983-84

Skill area	Number of questions	Average percent correct score 1983-84
WRITTEN EXPRESSION, TOTAL	396	59.04
Writing Process Skills	242	55.6
Pre-writing organization	16	65.9
Selecting titles	16	71.9
Critical judgments	37	54.5
Judging student writing	16	51.2
Critical thinking	21	57.0
Overall organization	44	52.1
Analyzing	13	57.3
Improving overall organization	17	33.2
Transitional elements	14	46.0
Paragraphs	31	56.6
Analyzing structure	16	55.9
Improving paragraphs	15	57.3
Sentence manipulation	32	47.6
Sentence combining	15	49.3
Effective and economic	17	46.1
Sentence recognition	30	48.7
Run-ons and fragments	15	42.6
Recognizing complete sentences	15	54.9
Language choices	36	61.2
Specificity/sensory/tone	16	55.1
Precise word choices	20	66.1
Supporting Skills	154	64.4
Standard English usage	31	64.5
Verbs	15	62.6
Pronouns and modifiers	16	66.4
Capitalization and punctuation	31	61.4
Capitalization	16	61.0
Punctuation	15	61.8
Spelling	92	65.4
Predictables	28	67.4
Suffixes	19	65.8
Demons	30	63.9
Homophones	15	63.9

Table 18 (continued)

Skill area	Number of questions	Average percent correct score 1983-84
Written Expression in the Content Areas		
Spelling	92	65.4
In reading and literature (general)	49	60.3
In science	19	71.1
In social studies	24	70.9
Language choices	36	61.3
In response to literature	12	61.3
In science	12	65.1
In social studies	12	57.4
Sentence recognition and manipulation	62	48.1
In response to literature	22	48.1
In science	21	49.2
In social studies	19	47.0
Paragraphs and overall organization	75	54.0
In response to literature	25	55.2
In science	25	52.5
In social studies	25	54.3
Critical judgments	37	54.5
In response to literature	12	50.5
In science	11	49.3
In social studies	14	62.1

Table 19

Written Expression Scores of California Twelfth Grade Students on the Survey of Basic Skills: Grade 12, 1975-76 Through 1983-84

	Total written expression	Writing process skills				Supporting skills		
		Paragraphs	Sentence manipulation	Sentence recognition	Language choices	Word forms	Capitalization/ punctuation	Spelling
Number of questions	142	26	12	20	32	24	28	72
	Average percent correct score							
1975-76	62.3	59.9	42.9	67.3	66.9	72.6	54.6	68.0
1976-77	61.9	59.1	42.9	67.7	66.7	72.1	54.3	67.9
1977-78	62.1	59.3	43.4	68.4	66.6	72.1	54.7	68.4
1978-79	62.4	59.7	43.7	68.8	66.6	71.9	55.4	68.4
1979-80	62.4	59.7	43.7	69.0	66.3	72.2	55.4	68.8
1980-81	63.1	60.2	44.3	70.1	66.7	72.5	56.6	69.0
1981-82	63.2	60.5	44.6	70.1	66.9	72.1	56.8	69.5
1982-83	63.0	60.3	44.6	70.1	66.3	71.5	57.2	69.5
1983-84	62.6	59.8	44.4	69.7	65.4	70.9	57.2	69.4
	Change in average percent correct score							
1975-76 to 1976-77	-0.4	-0.8	-0-	+0.4	-0.2	-0.5	-0.3	-0.1
1976-77 to 1977-78	+0.2	+0.2	+0.5	+0.7	-0.1	-0-	+0.4	+0.5
1977-78 to 1978-79	+0.3	+0.4	+0.3	+0.4	-0-	-0.2	+0.7	-0-
1978-79 to 1979-80	-0-	-0-	-0-	+0.2	-0.3	+0.3	-0-	+0.4
1979-80 to 1980-81	+0.7	+0.5	+0.6	+1.1	+0.4	+0.3	+1.2	+0.2
1980-81 to 1981-82	+0.1	+0.3	+0.3	-0-	+0.2	-0.4	+0.2	+0.5
1981-82 to 1982-83	-0.2	-0.2	-0-	-0-	-0.6	-0.6	+0.4	-0-
1982-83 to 1983-84	-0.4	-0.9	-0.2	-0.4	-0.9	-0.6	-0-	-0.1
Total change, 1975-76 to 1983-84	+0.3	-0.1	+1.5	+2.4	-1.5	-1.7	+2.6	+1.4

The committee observed that the paragraphs skill area has shown an overall gain of 4.5 percent correct since 1979-80; sentence recognition, 4.4 percent correct; and language choices, 4.7 percent correct. Of the writing process skills, the skill element registering the greatest gain over time (5.9 percent correct) tests the ability to form complete sentences by supplying subjects. Performance on these and other sentence recognition questions probably reflects children's intuitive sensitivity to the sentence derived from their familiarity with oral language. Members of the committee reaffirmed that students should be involved in a wide variety of oral language experiences that support the composing process.

The committee members were especially gratified to observe another year of gains in the language choices skills, which have been designated by the committee in previous years for special instructional attention. Members stressed that teachers need to help children use more specific and sensory detail in their own writing. While pleased with the gains registered by third graders in the supporting skills, members of the committee cautioned that primary-age students must be given many opportunities to write as well as to master the conventions of language. Several researchers have found that many students in the early grades are writing too little.

Donald Graves, Professor of English Education at the University of New Hampshire, conducted a survey of school systems that were reputed to stress writing. He found that second graders averaged only three pieces of writing in three months' time. In A Place Called School, John I. Goodlad reported that while students spent a great deal of time on writing in the early years, the most commonly required assignments involved answering simple questions and filling in blanks (John I. Goodlad, A Place Called School, New York: McGraw-Hill, 1984). Members of the committee stressed that promoting fluency in writing be a central concern for primary teachers and that the desire to teach correctness in language should not interfere with this major objective.

Instructional Recommendations for Grade Three

The members of the English Language Assessment Advisory Committee concluded their analysis of the grade three test results by offering the following instructional recommendations:

1. Primary grade teachers should nurture fluency in students' own writing; a concern for correctness in language should not interfere with the major objective of nurturing this fluency.

2. More emphasis is needed in the area of language choices, which would offer primary grade children numerous opportunities to learn to use specific and sensory detail in their writing.

3. Efforts to develop sentence and paragraph sense in primary grade children should be continued through a wide variety of oral and written activities in which active use of language is central.

4. The focus of instruction should be whole units of thought rather than fragmented pieces of language isolated from context.

5. Teachers should encourage parents and other persons responsible for child care to:

- o Provide an environment in which books and magazines figure prominently.
- o Read aloud to children.
- o Let children see adults read to themselves (modeling reading).
- o Take children to the library.
- o Discuss reading with children.
- o Encourage frequent writing.
- o Display children's writing at home.

Grade Six

Members of the English Language Assessment Advisory Committee were pleased with the 0.3 percent correct gain shown for sixth grade written language from 1982-83 to 1983-84 and with the increases in most of the language skill elements. They were particularly pleased that sentence combining skills have shown the largest cumulative gains since 1981-82 (2.8 percent correct) and that the critical thinking questions assessed under judging student writing again showed an increase (0.1 percent correct) in 1983-84. The committee speculated that the decline in paragraphing skills and the use of conjunctions may be tied to the decline in reading skills registered this year at grade six. Members expressed special concern over those declines as well as those in the area of language choices.

The committee members were pleased to observe gains in the area of judging student writing because the questions require students to judge the strengths, weaknesses, and overall rhetorical success of a sample of student writing. These questions test critical thinking in that they require students to evaluate the quality of thought and ideas and the effectiveness of expression in a short student essay. The structure and content of questions covering this skill area imply that the ability to write is virtually inseparable from the ability to think, revise, and rethink. For this reason members of the committee were particularly pleased to see a second year of gains in judging student writing, however modest.

The National Institute of Education reported that one survey of writing instruction in elementary schools showed that most instruction consisted of workbook exercises and drills in penmanship, vocabulary, spelling, capitalization, punctuation, and standard English usage, with very few opportunities for students to write.

Given these findings and the common perception of insufficient writing opportunities, members of the committee were especially impressed that of all the areas assessed on the sixth grade written language test, the area showing the greatest cumulative gains since 1981-82 was that of sentence combining (2.8 percent correct). As is stated in the Handbook for Planning an Effective Writing Program:

> Sentence combining is a technique for combining short sentences into longer, carefully constructed sentences. Over the past ten years, several studies of classes from the elementary school level through the first year in college have shown that sentence-combining exercises, both oral and written, even when conducted with little or no grammatical terminology, can be

effective in increasing the sentence-writing maturity of students.

George Hillocks, researcher at the University of Chicago, recently reviewed 60 studies on the effectiveness of writing instruction, involving over 12,000 students. One of his conclusions from the review of research was that the use of sentence combining techniques improved the writing of most students. These techniques teach students how to rewrite complicated phrases and build paragraphs out of simple sentences. According to Mr. Hillocks, sentence combining exercises may help expand the range of options that students have available for expressing ideas. The fact that sentence-combining skills showed the greatest gains on the sixth grade written language test over the two-year period is, as one committee member put it, "a pleasant surprise." The increases in sentence recognition skills (0.3 percent correct) also suggest that effective instructional attention at the sixth grade seems to be devoted to sentence-level skills.

Disturbed by the declines in paragraphing skills, an important text-level skill area, members of the committee commented that perhaps insufficient instructional time is being devoted to paragraph development and whole units of thought. Helen Lodge, Professor of Education at California State University, Northridge, and the chairperson of the committee, pointed out the direct parallels between the declines in paragraphing and conjunctions and the decline in reading skills at grade six.

The committee members also viewed the losses in language choices with concern because the ability to control tone and achieve vividness and precision through careful word choices is one of the most important writing competencies teachers can develop. They also noted parallels between the decline in language choices skills and the decline in vocabulary at grade six. Observing that paragraphs and language choices were the two areas of greatest decline on the twelfth grade test, members of the committee stressed that teachers emphasize paragraph development skills and careful word choices in the context of student writing at elementary and secondary grade levels.

Instructional Recommendations for Grade Six

After reviewing the results of the grade six test, the committee recommended the following:

1. Writing instruction should include more writing, more teaching of writing, a greater variety of writing assignments, and adherence to the principles set forth in the Handbook for Planning an Effective Writing Program.

2. California Assessment Program results, as well as assessments of students' writing, should be used for analyzing strengths and weaknesses in students' writing and for setting goals.

3. Writing instruction should be integrated with the teaching of reading in all content areas. In language arts instruction, writing should be integrated with the teaching of literature.

4. While students are engaged in the act of writing, only the process skills of writing should be emphasized. The supporting skills of writing should be taught as needed during the editing phase of the writing process and should not be neglected.

5. More emphasis is needed in the areas of language choices, vocabulary development, and paragraph skills in the intermediate grades as well as throughout junior high school.

Grade Eight

The Survey of Academic Skills: Grade 8 was administered for the first time in 1983-84. Almost all the multiple-choice written expression questions were based on student essays written in response to one of the reading passages in the content areas of science, social studies, or literature. Both the area of "choices," i.e., the selection of words, sentence patterns, and rhetorical strategies (writing process skills), and the area of "givens," i.e., correct forms (supporting skills), were assessed; however, more emphasis was given to the former than to the latter.

Members of the committee observed that in general, the scores in most of the supporting elements tended to be higher than those for the writing process skills, a fact that led them to remark that mechanics should not take precedence over the higher-order thinking/writing skills that are closely tied to effectiveness of expression. In recent years many researchers have become critical of writing instruction that focuses primarily on "error and error avoidance" to the exclusion of all else. Arthur Applebee, Professor of Education at Stanford University, drew the following conclusion from a national study of secondary school writing supported by the National Institute of Education:

> Grammar and spelling and punctuation are very much overemphasized, partly because they're very much easier to see in students' papers. . . . Supporting or organizing an argument is much harder to comment on . . . with the result that teachers spent very little time focused on the meaning of what students wrote (Education Week, September 5, 1984).

George Hillocks reached the same conclusion from his review of writing instruction research and offered the following interpretation:

> Some people are interested in mechanical correctness first. But I think focusing on mechanical correctness denies kids a chance to really think about ideas. And it appears to students, when a teacher is hitting mechanics all the time, that what's important is getting it right, not getting anything said. And so writing becomes regarded by youngsters as kind of silly, not very important (Education Week, September 5, 1984).

The committee members who analyzed item-level results observed that eighth graders had special difficulty with items dealing with comparison and contrast patterns in the student essays. Some members speculated that students need more exposure to the internal structural patterns of different types of compositions and that comparison and contrast analysis strategies should be taught in all the

content areas. They also noted that students encountered difficulty when asked to discriminate between general and specific concepts. Many of their errors in all skill areas appeared to be the result of hurried and careless reading.

Members of the committee stressed that the eighth grade written expression test is quite different from typical publishers' tests in that it calls attention to phases of the writing process including prewriting, revising, and editing. They concluded that eighth grade performance on many of the writing process skills indicates that students need more practice revising drafts. Yet in the "National Study of Secondary School Writing," Mr. Applebee reported that very little rewriting is going on in the public schools. He added that while teachers' comments on student papers were often "extensive and thoughtful," they were "in one sense, irrelevant, in that there was no rewriting discussed. Though the comments were perceptive, they were not part of an overall writing process."

Members of the committee concluded that since the test is based on the writing process, districts should review their curricula to ensure the reinforcement of the writing process as described in the Handbook for Planning an Effective Writing Program and in the Model Curriculum Standards, Grades Nine Through Twelve.

Instructional Recommendations for Grade Eight

After reviewing the results of the eighth grade test, the committee recommended the following:

1. This test is based on the assumption that all students have had experiences with the writing process; consequently, it is recommended that districts review their curricula and English language textbooks as to their reinforcement of the writing process as it is described in the Handbook for Planning an Effective Writing Program and in the Model Curriculum Standards, Grades Nine Through Twelve.

2. Students should have opportunities to observe good modeling of the different stages in the writing process: prewriting, composing, revising, and editing.

3. Students should be given more opportunities to revise their drafts many times through a process in which they rethink their writing in terms of its purpose and communicative intent.

4. Students should be involved in a wide variety of oral language experiences that support the composing process. Oral language experiences require students to support general statements with specific statements, using descriptive rather than merely judgmental language. Asking students to render into precise language their experiences and convictions will help provide the base for written composition.

Grade Twelve

The Survey of Basic Skills: Grade 12 has been administered since 1975-76. The members of the English Language Assessment Advisory Committee expressed

concern over the 0.4 percent correct decline in written expression from 1982-83 to 1983-84, which marked the second year of losses in written expression after a five-year trend of stability or improving scores.

Members of the committee judged that the largest declines--paragraphs (-0.9 percent correct) and language choices (-0.9 percent correct)--were in important areas. They noted that the only skill area that did not decline was capitalization and punctuation.

The skill areas showing the greatest total increases from 1975-76 to 1983-84 are sentence recognition (2.4 percent correct) and capitalization and punctuation (2.6 percent correct). This pattern may reflect the "back to basics" emphasis and concern for conventions and correctness resulting from district proficiency testing. The members of the advisory committee concluded that while such skills as usage, word forms, and capitalization are important supporting skills, greater attention should be devoted to the writing process skills--language choices, sentence manipulation, and paragraphs. The committee stressed that skills instruction should not be overemphasized at the expense of the total writing process and that skills should be taught as needed in support of writing (taking care not to neglect them).

Given the second consecutive year of declining twelfth grade written expression scores, members of the English Language Assessment Advisory Committee stressed that they are in support of any effort to increase the amount of quality instructional time for composition. This need has been publicized by a report from the Carnegie Foundation (E. L. Boyer, High School: A Report on Secondary Education in America, New York: Harper and Row, 1983), which states that:

- Writing should be taught in every class.
- Clear writing leads to clear thinking.
- Clear thinking is the basis of clear writing.

Boyer also says that "writing holds us responsible for our words and ultimately makes us more thoughtful human beings."

The committee also expressed concerns about the need for resources to support the teaching of writing, the need to ensure the qualifications of those teaching English courses, and the importance of both local and statewide writing assessments. These concerns are expressed here as the committee's policy recommendations and are followed by the committee's instructional recommendations for grade twelve.

Policy Recommendations for Grade Twelve

After reviewing the results of the twelfth grade test, the committee made the following policy recommendations:

1. The Department of Education should include writing samples at various grade levels as part of the California Assessment Program to better assess students' writing abilities, to promote instruction in reading/writing/thinking skills across the curriculum, and to better reflect the Model Curriculum Standards, Grades Nine Through Twelve.

2. Districts should require four years of English for high school graduation as recommended by the State Board of Education in Raising Expectations--Model Graduation Requirements (Sacramento: California State Department of Education, 1983).

3. Districts should make efforts to increase the amount of quality instructional time for composition.

4. Additional resources are needed at the classroom level to support and assist those responsible for the teaching of writing.

5. Districts should take steps to ensure that those teaching language, composition, and literature are well qualified.

Instructional Recommendations for Grade Twelve

The members of the committee concluded their analysis of the grade twelve test results by offering the following instructional recommendations:

1. Writing instruction should include more writing, more teaching of writing, a greater variety of writing assignments, and adherence to the principles set forth in the Handbook for Planning an Effective Writing Program.

2. Writing should be integrated with the teaching of reading in all content areas. In English instruction, writing should be integrated with the teaching of literature.

3. While students are engaged in the act of writing, the process skills of writing should be emphasized. Later, during the act of editing, the supporting skills of writing should be emphasized as the need arises and should not be neglected.

4. Teachers should do more writing themselves, especially in the classroom with their students, on the topics they assign.

5. Various types of writing activities and events (such as writing celebrations, writing showcases, write-athons, writing fairs, and writing olympics) should be planned and conducted to emphasize the importance of writing and to provide out-of-classroom audiences for the students' writing.

6. The California Assessment Program's results, as well as assessment of students' writing, should be used for analyzing strengths and weaknesses in students' writing and for setting goals.

Attitudes Toward Writing as Compared to Reading

One of the chief concerns of the English Language Assessment Advisory Committee and the Reading Assessment Advisory Committee has been that students develop positive attitudes toward reading and writing. In 1983-84 both third and sixth grade students were asked to report how much they like to read and write. This was the fifth consecutive year the attitudinal questions were asked at grade three and the second year at grade six.

The questions asked at each of the grades are shown below:

Grade three

How much do you like to write your own stories?

O Very much
O A little
O Not at all

Grade six

How much do you like:

	Very much	A little	Not at all
To read?	O	O	O
To write?	O	O	O

The responses to the questions for both grades are shown in tables 20, 21, 22, and 23.

Table 20

Third Grade Students' Attitudes Toward Reading and Average Percent Correct Scores in Reading, 1979-80 Through 1983-84

Response	Percent of students					Percent correct score				
	1979-1980	1980-1981	1981-1982	1982-1983	1983-1984	1979-1980	1980-1981	1981-1982	1982-1983	1983-1984
Very much	65	66	65	65	65	73.4	73.6	74.2	75.1	75.9
A little	30	30	30	30	30	68.1	68.7	69.8	71.4	72.6
Not at all	5	4	5	5	5	51.1	52.0	54.0	56.5	58.0

Table 21

Third Grade Students' Attitudes Toward Writing and Average Percent Correct Scores in Written Language, 1979-80 Through 1983-84

Response	Percent of students					Percent correct score				
	1979-1980	1980-1981	1981-1982	1982-1983	1983-1984	1979-1980	1980-1981	1981-1982	1982-1983	1983-1984
Very much	51	51	51	51	52	75.8	76.3	77.2	78.3	79.4
A little	34	34	34	34	33	76.0	76.6	77.6	78.8	79.7
Not at all	15	15	15	15	15	71.2	72.0	73.6	75.2	76.2

Table 22

Sixth Grade Students' Attitudes Toward Reading and Average Percent Correct Scores in Reading, 1980-81 and 1983-84

	Percent of students		Percent correct score	
	1980-81	1983-84	1980-81	1983-84
Very much	48	44	72.6	76.4
Some*	48	51	64.7	67.6
Not at all	4	5	59.1	63.2

* "some": 1980-81; "a little": 1982-83

Table 23

Sixth Grade Students' Attitudes Toward Writing and Average Percent Correct Scores in Writing, 1980-81 and 1983-84

	Percent of students		Percent correct score	
	1980-81	1983-84	1980-81	1983-84
Very much	31	44	68.4	73.1
Some*	51	43	66.7	70.7
Not at all	18	16	62.7	68.1

* "some": 1980-81; "a little": 1982-83

The following conclusions are evident from tables 20, 21, 22, and 23:

- At grade three, attitudes toward reading and writing have remained basically constant over the last five years. Third grade attitudes toward writing improved slightly in 1983-84.
- Reading tends to be more popular with third graders than writing. Almost two-thirds of the third graders reported that they liked to read very much. On the other hand, only about one half of them reported liking to write their own stories very much, and 15 percent reported not liking to write their own stories at all.
- At grade three, higher reading scores are associated with more positive attitudes toward reading, but the relationship between written language scores and attitudes toward writing is weaker.

- Sixth graders' attitudes toward writing have improved substantially while their attitudes toward reading have declined in the last three years. In 1983-84, 41 percent of the students reported liking to write their own stories very much--10 percent more than in 1980-81. The percentages shifted from 48 to 44 percent for liking to read very much. As a result of these shifts, reading tends to be just slightly more popular than writing with sixth graders.

- Sixth graders are less positive than third graders about both reading and writing.

- At grade six higher reading scores are associated with more positive attitudes toward reading, and higher written language scores are associated with more positive attitudes toward writing stories.

Frequency of Writing Assignments

In 1983-84 sixth and twelfth grade students were asked to respond to the following question regarding the number of writing assignments required in school:

> How many reports and stories have you written during the last six weeks as part of any school assignment?
>
> - o None
> - o 1
> - o 2
> - o 3
> - o 4 or 5
> - o 6 to 10
> - o 11 or more

The responses to this question and the written expression scores are shown in Table 24.

Table 24

Written Expression Scores of Sixth and Twelfth Grade Students, by Number of Writing Assignments in a Six-Week Period, 1980-81 and 1983-84

Number of assignments	Percent of students				Written expression scores	
	Grade 6		Grade 12			
	1980-81	1983-84	1980-81	1983-84	Grade 6	Grade 12
0	4	4	22	4	66.6	57.1
1	5	6	15	4	69.8	60.0
2-3	17	15	28	17	72.6	61.3
4-5	23	23	18	21	73.6	63.1
6-10	28	24	12	23	75.9	64.7
11+	23	28	5	31	76.8	63.9
Average	23	24	11	25	-	-

The following conclusions are evident from the data in Table 24:

- In 1983-84 sixth graders reported writing, on the average, 24 reports or essays during the previous six-week period, about the same as in 1980-81.

- In 1983-84 twelfth graders reported writing 25 reports or essays over the previous six-week period, compared to 11 reports or essays reported by the twelfth graders in 1978-79.

- At both grades, higher test scores in written expression tend to be associated with increased frequency of writing assignments.

Years of English Taken

In 1983-84 twelfth grade students were asked to report the number of English courses they had taken. This question had been asked previously in 1978-79 and 1981-82. The data for all three years and the percent correct scores for 1983-84 are shown in Table 25.

Table 25

Twelfth Grade Students' Years of English Taken and Written Expression Scores, 1978-79, 1981-82, and 1983-84

Years of English	Percent of students			Percent correct score
	1978-79	1981-82	1983-84	1983-84
0-1	1	1	1	43.0
2	5	3	2	49.0
3	36	22	22	58.1
4 or more	58	74	75	64.9

The College Board also asks students taking the Scholastic Aptitude Test (SAT) to report the number of English courses they took during high school. The percentages, since 1979, of those taking four years of English are as follows:

1979....78%
1980....81%
1981....88%
1982....90%
1983....91%
1984....93%

The following conclusions are evident from the data in Table 25 and the SAT findings:

- Data from both CAP and The College Board show increasing numbers of high school students are taking four or more years of English. In 1984, 75 percent of twelfth graders reported taking four or more years of English--17 percent more than in 1979.

- Higher written expression scores were directly associated with the number of English courses students reported taking. The highest written expression scores were achieved by those taking four or more years of English.

The data pertaining to attitudes toward writing and the frequency of writing assignments suggest a need for increased instructional attention to writing at all grade levels. Third graders showed slight improvement in their attitudes toward writing while their attitudes toward reading remained constant. Sixth graders' attitudes toward writing improved substantially (with 13 percent more reporting that they like to write their own stories very much); however, their attitudes toward reading declined. The average number of writing assignments reported by sixth graders in a six-week period shifted from 23 to 24. Members of the Reading Assessment Advisory Committee speculated that the declines in reading achievement scores at grade six might reflect displacement of reading instruction because of increased attention to writing.

The most dramatic increases in frequency of writing assignments, however, were shown at grade twelve. The number of reports or essays written over a six-week period shifted from 11, on the average, in 1980-81 to 25 in 1983-84. This increase is consistent with the fact that a slightly higher percentage of students is taking four or more years of English than a few years ago.

Committee members concluded that the changes in attitudes toward writing and the frequency of writing assignments probably reflect the impact of the California Writing Projects.

The increasing numbers of students taking four or more years of English were attributed to changing entrance requirements of the University of California and California State University systems. The U.C. system began requiring four years of English in 1981, and the C.S.U. system, in the fall of 1984. The committee also noted the positive impact of model graduation requirements approved by the State Board of Education in 1983.

V. Mathematics

Synopsis of Findings

- Grade three mathematics scores improved by 1.2 percent correct between 1982-83 and 1983-84. Scores improved in all 30 reported skill areas for the first time since the Survey of Basic Skills: Grade 3 was first given in 1979-80. This was the fourth consecutive year that scores improved in mathematics at grade three, yielding an overall gain of 4.2 percent correct from 1979-80 to 1983-84.

- Grade six mathematics scores for 1983-84 rose a modest 0.1 percent correct over the scores of the previous year. This, however, was the second consecutive year of improvement in total mathematics scores at grade six, yielding an overall gain of 0.6 percent correct from 1981-82 to 1983-84. From 1982-83 to 1983-84, gains were made in 23 of 50 reported skill areas; no change was made in six skill areas; and declines occurred in 21 skill areas. Most gains occurred on simple problems; scores generally remained the same or declined on complex problems.

- This year was the first year of the eighth grade test. Overall, students answered 54.8 percent of the questions correctly in mathematics. A study revealed that eighth grade students perform 1.6 to 6.0 percent correct lower than other eighth graders in the U.S. In a comparison of mathematics achievement in 21 countries, California students on average ranked at or above students in only two countries in measurement, three countries in geometry, six countries in algebra, and seven countries in arithmetic.

- Grade twelve mathematics scores in 1983-84 declined a modest 0.3 percent correct over the previous year; however, there has been an overall gain of 0.4 percent correct over the nine-year period from 1975-76 through 1983-84. In 1983-84, gains in scores occurred in five of the 30 reported skill areas; no change occurred in three skill areas; and declines occurred in 22 skill areas.

- The median third grade student in California is now scoring at the 53rd percentile on national norms in mathematics; the median sixth grade student is at the 62nd percentile; the median eighth grade student is at the 48th percentile; and the median twelfth grade student is at the 45th percentile. (See Chapter VIII, "Comparisons with National Norms.")

Committee's Recommendations

After reviewing the results presented in this section, the Mathematics Assessment Advisory Committee (members' names and affiliations appear in the appendix) made the following general recommendations:

- A substantial increase in the number of high school students enrolled in and adequately prepared to take high school level mathematics courses must occur.

- Instruction must be given in all strands of the mathematics curriculum to all students and at grade level. Students should not be relegated to programs that only provide instruction in the computational aspects of arithmetic.

- Heavy and continuing emphasis should be placed on mental arithmetic, estimation, and approximation skills.

- There should be a heavy and continuing development of problem-solving skills, including the appropriate use of calculators or computers.

- Drill on arithmetic computational skills involving, for example, three-digit (or greater) whole numbers, numerical fractions with large denominators, and so on, should be deemphasized.

- Students should be given more instruction in place values; decimals; percents; scientific notations; relative sizes of numbers; comparisons and conversions of decimals, percents, and fractions; elementary data analysis; statistics; probability; geometric relationships in two and three dimensions; patterns and functions; and the correct and appropriate use of mathematical language and symbols at all appropriate grade levels.

- Increased emphasis should be placed on the basic mathematical properties in such a manner that students see the relationships between the various areas of mathematics rather than viewing them as disjointed or unrelated topics.

- Students should be more involved in activities that demand the use of problem formulation, selection of strategies for the analysis and solution of problems, the analysis and interpretation of solutions, and small group discussion of problem situations.

Scope of the Grade Three Mathematics Test

The Survey of Basic Skills: Grade 3 was developed to assess the levels of mathematics skills of third grade students in California. The 360 items on the Survey were designed to assess students' skills in the area of arithmetic (counting and place value, nature of numbers and properties, and operations), geometry, measurement, patterns and graphs, and problem analysis and models. In each area, with the exception of problem analysis and models, the test items include computational skills and knowledge of terminology as well as word problems. The emphasis placed on each skill area in the total test is illustrated in Figure 2.

The emphasis on each skill area in the third grade Survey is consistent with the mathematics curricula of most California schools and additionally reflects the concept of problem solving/applications emphasized in the

Mathematics Framework and the 1980 Addendum for California Public Schools: Kindergarten Through Grade Twelve (Sacramento: California State Department of Education, 1982). A detailed description of the skills assessed in the third grade Survey is given in Survey of Basic Skills: Grade 6--Rationale and Content.

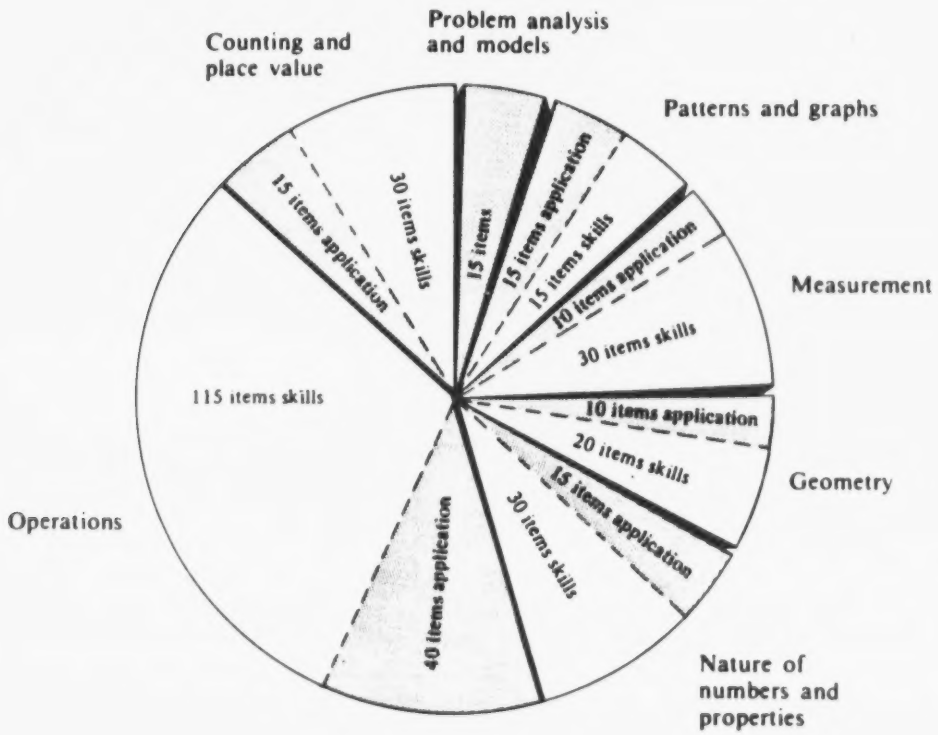


Fig. 2. Number of questions, by skill area, in the mathematics portion of the *Survey of Basic Skills: Grade 3*

Mathematics Results for Grade Three

The results of the third grade mathematics assessment for 1983-84 are shown in Table 26. This was the fifth year of the assessment in mathematics in grade three. Longitudinal comparisons are also given in Table 26 for the five-year period (1979-80 through 1983-84).

As shown in Table 26, the average California third grade student in 1983-84 correctly answered 78.9 percent of the questions in arithmetic skills; 78.4 percent in geometry; 76.4 percent in measurement; 78.0 percent in patterns and graphs; 73.7 percent in problem analysis and models; and 75.6 percent in problem solving/applications. Overall, the average third grade student correctly answered 78.3 percent of the mathematics questions.

Table 26

Mathematics Scores of California Third Grade Students and Changes in Mean Scores on the Survey of Basic Skills: Grade 3, 1979-80 Through 1983-84

Skill area	No. of questions	Mean score					Change				Total change
		1979-80	1980-81	1981-82	1982-83	1983-84	1979-80 to 1980-81	1980-81 to 1981-82	1981-82 to 1982-83	1982-83 to 1983-84	1979-80 to 1983-84
MATHEMATICS, TOTAL	360	74.1	74.7	76.0	77.1	78.3	+0.6	+1.3	+1.1	+1.2	+4.2
Arithmetic	245	74.5	75.1	76.4	77.7	78.9	+0.6	+1.3	+1.3	+1.2	+4.4
Count and place value	45	79.3	79.9	81.3	82.3	83.1	+0.6	+1.4	+1.0	+0.8	+3.8
Skills	30	79.7	80.3	81.9	82.7	83.5	+0.6	+1.6	+0.8	+0.8	+3.8
Applications	15	78.5	79.1	80.3	81.5	82.4	+0.6	+1.2	+1.2	+0.9	+3.9
Operations	155	72.7	73.3	74.8	76.3	77.7	+0.6	+1.5	+1.5	+1.4	+5.0
Basic facts	25	85.9	86.3	87.5	88.4	89.6	+0.4	+1.2	+0.9	+1.2	+3.7
Addition	30	82.6	83.4	84.7	86.0	87.0	+0.8	+1.3	+1.3	+1.0	+4.4
Subtraction	30	69.9	71.0	73.1	75.3	76.4	+1.1	+2.1	+2.2	+1.1	+6.5
Multiplication	30	63.7	64.5	66.7	68.6	71.0	+0.8	+2.2	+1.9	+2.4	+7.3
Application	40	65.7	65.9	66.7	67.9	69.2	+0.2	+0.8	+1.2	+1.3	+3.5
Basic facts	13	68.0	67.9	68.6	69.8	71.0	-0.1	+0.7	+1.2	+1.2	+3.0
Addition/subtraction	15	75.0	76.0	77.4	79.0	80.0	+1.0	+1.4	+1.6	+1.0	+5.0
Multiplication	12	51.4	51.2	51.2	52.1	53.4	-0.2	0	+0.9	+1.3	+2.0
Nature of numbers and properties	45	75.8	76.3	77.4	77.9	79.0	+0.5	+1.1	+0.5	+1.1	+3.2
Properties and relationships	15	76.0	76.4	77.5	77.1	77.6	+0.4	+1.1	-0.4	+0.5	+1.6
Money and fractions	15	80.2	81.1	82.4	83.4	85.4	+0.9	+1.3	+1.0	+2.0	+5.2
Applications	15	71.1	71.5	72.2	73.2	74.1	+0.4	+0.7	+1.0	+0.9	+3.0
Geometry	30	74.9	75.1	76.6	77.1	78.4	+0.2	+1.5	+0.5	+1.3	+3.5
Skills	20	76.3	76.3	77.7	78.3	79.5	0	+1.4	+0.6	+1.2	+3.2
Applications	10	72.0	72.8	74.3	74.8	76.2	+0.8	+1.5	+0.5	+1.4	+4.2
Measurement	40	73.4	74.0	74.6	75.3	76.4	+0.6	+0.6	+0.7	+1.1	+3.0
Linear measures	15	69.7	70.6	72.0	72.3	73.5	+0.9	+1.4	+0.3	+1.2	+3.8
Other measures	15	78.4	78.6	78.3	79.1	79.9	+0.2	-0.3	+0.8	+0.8	+1.5
Applications	10	71.4	72.2	72.8	74.2	75.6	+0.8	+0.6	+1.4	+1.4	+4.2
Patterns and graphs	30	73.8	74.6	75.9	76.8	78.0	+0.8	+1.3	+0.9	+1.2	+4.2
Skills	15	63.5	64.1	65.7	66.2	67.5	+0.6	+1.6	+0.5	+1.3	+4.0
Applications	15	84.1	85.0	86.2	87.4	88.4	+0.9	+1.2	+1.2	+1.0	+4.3
Problem analysis and models	15	70.1	70.5	71.2	72.5	73.7	+0.4	+0.7	+1.3	+1.2	+3.6
Problem solving/applications*	120	71.5	72.3	73.2	74.4	75.6	+0.8	+0.9	+1.2	+1.2	+4.1

*Questions in this category are an aggregate of 105 application questions and 15 questions in problem analysis and models.

The following conclusions can be drawn about the 1983-84 mathematics performance of California third grade students:

- The typical third grade student in California was able to answer nearly four-fifths of the test questions correctly.
- The average percent correct scores increased in all of the major subskill areas over those recorded in 1982-83.
- The highest percent correct score was in operations using basic facts (89.6 percent correct), followed closely by applications with graphs (88.4 percent correct), addition operations (87.0 percent correct), and money and fraction problems (85.4 percent correct).

Summary of the Committee's Conclusions

The members of the Mathematics Assessment Advisory Committee reviewed the results of the third grade students by skill areas and by items within each skill area. The committee members made the following general remarks about the performance of third grade students in California public schools:

- All scores in all categories have increased for the first time since the inception of CAP testing in the third grade.
- The strong performance and growth in mathematics scores over the five-year period is noteworthy. This indicates that a strong, comprehensive mathematics instructional program exists in kindergarten through grade three in California public schools and should be continued to ensure steady improvement in all mathematical skills and concepts.

Instructional Recommendations

The members of the Mathematics Assessment Advisory Committee made the following recommendations for the improvement of mathematics skills in the third grade:

- The current successful emphasis on place value should be continued, because this concept is the key to the understanding of arithmetic operations. In addition, the meaning of arithmetic operations should be continuously stressed and illustrated.
- Students should be given opportunities to develop the vocabulary and mathematical notation needed to discuss mathematical concepts and perform mathematical computations.
- Classroom discussion and small group activities should replace some of the individual paper and pencil activities. Students should be given more practice in reading and discussing mathematical problem situations.
- Teachers should give students concrete experiences to help them discriminate between standard units of length, volume, mass, and

temperature, and to help them select when to apply them in measurement of common objects. At the third grade level, all measurement concepts should be developed using concrete materials.

- Instructional emphasis should be given to developing the understanding of the subtraction algorithm, with renaming, through the use of manipulative materials. A thorough understanding of place value is needed to improve the understanding of this algorithm.

- Students should be confronted with many sets of application problems that randomly involve any of the four basic operations and that require the selection and use of the correct operation or operations.

- An emphasis on applications to real-life situations of all computational skills, especially multiplication, is recommended.

- New concepts and skills should be introduced, with concrete manipulative objects, and then carefully connected with the symbolic representations before students are required to manipulate symbols by themselves.

- Students should have experiences in providing missing parts of specific problems representing common computational algorithms, so that the students will learn about the various components of those algorithms.

- Students should be given completed problems with errors present and be asked to identify and explain the errors.

- Students should be provided with practice, oral and written, using "100 more than," "100 less than," and similar phrases for other numbers.

- Students should have opportunities to estimate results and compare those estimates with their computational results.

- Geometric spatial concepts should be developed by providing students with many activities using concrete manipulative objects.

- Computational problems should be presented in several formats: vertical or horizontal arrangement, mental arithmetic, equation form, calculator algorithm format, and so forth.

- To preserve equity in learning for all students, teachers should give students instruction in the recommended skills and concepts listed in the Mathematics Framework.

Scope of the Grade Six Mathematics Test

The Survey of Basic Skills: Grade 6, first given in 1981-82, assesses the levels of mathematical skills of sixth grade students in California on a comprehensive set of subskills and is similar in breadth to the Survey of Basic Skills: Grade 3 and the new Survey of Academic Skills: Grade 8.

With the exception of problem solving and applications, the test items for each area include computational skills and knowledge of terminology as well as word problems. Figure 3 illustrates the emphasis placed on each skill area in the total test.

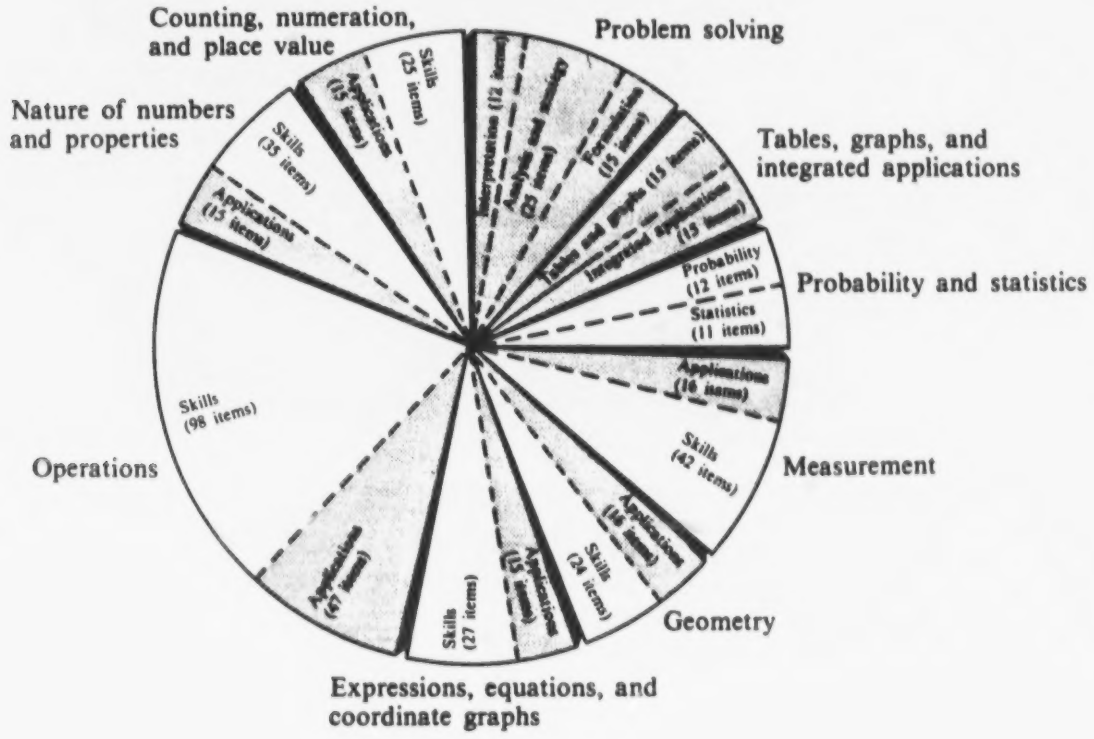


Fig. 3. Number of questions, by skill area, in the mathematics portion of the *Survey of Basic Skills: Grade 6*

A detailed description of the skills assessed in the sixth grade Survey is given in Survey of Basic Skills: Grade 6--Rationale and Content.

Mathematics Results for Grade Six

The results of the sixth grade mathematics assessment for 1983-84 are shown in Table 27. Overall, the percent correct increased by 0.1 percent from 1982-83 to 1983-84.

Table 27 shows that in 1983-84 California sixth grade students had an average percent correct score of 63.3 on the 480 questions in the total test. The skill-by-skill results were: 67.1 percent correct in counting, numeration, and place value; 61.3 percent correct in nature of numbers and properties; 63.4 percent correct in operations; 63.6 percent correct in expressions, equations, and coordinate graphs; 64.2 percent correct in geometry; 60.9 percent correct in measurement; 59.5 percent correct in probability and statistics; 67.1 percent correct in tables, graphs, and integrated applications; and 63.3 percent correct in problem solving.

Summary of the Committee's Conclusions

The members of the Mathematics Assessment Advisory Committee reviewed the results of the sixth grade test by skill areas and by items within each skill area. The committee members made the following general remarks about the performance of sixth grade students in California public schools:

- Sixth grade students scored highest in multiplication of whole numbers, with an average percent correct score of 79.7. The next highest subskill scores were 78.9 percent correct in addition/subtraction of whole numbers, and 74.1 percent correct in division of whole numbers.

- In operation applications, sixth grade students scored 69.0 percent correct in one-step problems involving whole numbers and 53.3 percent correct in one-step problems involving rational numbers. They scored lowest in application problems of two or more steps involving whole and rational numbers, with an average percent correct score of 49.3.

- In operations involving decimal fractions and percents, there was marked improvement of 0.9 percent over the previous year. However, the greatest gain, 1.5 percent, occurred in multiplication/division of decimals.

- There has been a substantial improvement in the understanding of place value over the last three years. Continued improvement in this area should lead to improved skills and understanding in operations, estimation, and mental computation.

- Overall, applications involving whole numbers and rational numbers in both one- and two-step problems have improved over the three-year period of CAP testing in the sixth grade.

- Both the skills and application categories of geometry have shown consistent improvement in the area of applications.

Instructional Recommendations

The members of the Mathematics Assessment Advisory Committee made the following recommendations for the improvement of mathematics skills in the sixth grade:

Table 27

Mathematics Scores of California Sixth Grade Students
on the Survey of Basic Skills: Grade 6, 1981-82 Through 1983-84

Skill area	No. of questions	Average percent correct			Change		Total change
		1981-82	1982-83	1983-84	1981-82 to 1982-83	1982-83 to 1983-84	1981-82 to 1983-84
MATHEMATICS, TOTAL	480	62.7	63.2	63.3	+0.5	+0.1	+0.6
Counting, numeration, and place value	40	64.7	66.6	67.1	+1.9	+0.5	+2.4
Skills	25	66.2	68.2	68.9	+2.0	+0.7	+2.7
Count and numeration	15	67.4	68.6	68.9	+1.2	+0.3	+1.5
Place value	10	64.5	67.6	68.9	+3.1	+1.3	+4.4
Applications	15	62.1	64.0	64.1	+1.9	+0.1	+2.0
Nature of numbers and properties	50	61.6	61.5	61.3	-0.1	-0.2	-0.3
Skills	35	61.4	61.3	61.3	-0.1	0	-0.1
Ordering and properties	15	67.1	67.0	66.6	-0.1	-0.4	-0.5
Classification of numbers	20	57.1	57.0	57.3	-0.1	+0.3	+0.2
Applications	15	62.1	62.0	61.5	-0.1	-0.5	-0.6
Operations	145	62.3	63.1	63.4	+0.8	+0.3	+1.1
Skills	98	65.6	66.6	67.0	+1.0	+0.4	+1.4
Addition/subtraction of whole numbers	15	79.2	79.4	78.9	+0.2	-0.5	-0.3
Multiplication of whole numbers	14	78.9	79.9	79.7	+1.0	-0.2	+0.8
Division of whole numbers	15	72.1	73.6	74.1	+1.5	+0.5	+2.0
Addition/subtraction of decimals	14	56.3	56.9	57.5	+0.6	+0.6	+1.2
Multiplication/division of decimals	12	54.0	57.5	59.0	+3.5	+1.5	+5.0
Operations on fractions	16	53.6	53.4	54.0	-0.2	+0.6	+0.4
Percents and equivalent fractions/decimals	12	63.6	63.9	64.8	+0.3	+0.9	+1.2
Applications	47	55.4	55.8	56.0	+0.4	+0.2	+0.6
One-step problems involving whole numbers	12	68.5	68.9	69.0	+0.4	+0.1	+0.5
One-step problems involving rational numbers	20	52.9	53.3	53.3	+0.4	0	+0.4
Two- (or more) step problems	15	48.4	48.8	49.3	+0.4	+0.5	+0.9
Expressions, equations, and coordinate graphs	42	63.1	63.9	63.6	+0.8	-0.3	+0.5
Skills	27	62.5	63.4	63.0	+0.9	-0.4	+0.5
Expressions and equations	15	66.3	66.1	65.4	-0.2	-0.7	-0.9
Graphs and function tables	12	57.8	59.9	59.9	+2.1	0	+2.1
Applications	15	64.0	64.9	64.8	+0.9	-0.1	+0.8
Geometry	40	62.8	63.5	64.2	+0.7	+0.7	+1.4
Skills	24	63.0	64.1	64.8	+1.1	+0.7	+1.8
Shapes and terminology	12	64.9	65.4	65.5	+0.5	+0.1	+0.6
Relationships	12	61.1	62.7	64.1	+1.6	+1.4	+3.0
Applications	16	62.4	62.6	63.3	+0.2	+0.7	+0.9
Measurement	58	60.8	61.0	60.9	+0.2	-0.1	+0.1
Skills	42	62.1	62.4	62.1	+0.3	-0.3	0
Metric units	20	59.2	60.0	60.0	+0.8	0	+0.8
U.S. Customary units	10	74.7	74.5	74.0	-0.2	-0.5	-0.7
Length, area, and volume	12	56.4	56.2	55.9	-0.2	-0.3	-0.5
Applications	16	57.6	57.3	57.6	-0.3	+0.3	0
Probability and statistics	23	60.1	59.8	59.5	-0.3	-0.3	-0.6
Probability	12	53.5	52.3	52.0	-1.2	-0.3	-1.5
Statistics	11	67.2	68.0	67.6	+0.8	-0.4	+0.4
Tables, graphs, and integrated applications	30	67.1	67.5	67.1	+0.4	-0.4	0
Tables and graphs	15	68.3	69.0	69.0	+0.7	0	+0.7
Integrated applications	15	65.8	65.9	65.3	+0.1	-0.6	-0.5
Problem solving	52	63.3	63.5	63.3	+0.2	-0.2	0
Formulation	15	70.1	70.1	69.4	0	-0.7	-0.7
Analysis and strategy	25	65.7	66.0	66.0	+0.3	0	+0.3
Interpretation	12	49.9	50.0	49.9	+0.1	-0.1	0
Total, applications problems	154	60.7	61.2	61.3	+0.5	+0.1	+0.6

- Instructional emphasis should be given to developing problem-solving skills, particularly estimation skills, checking of solutions skills, and the recognition of sensible or reasonable solutions.

- All students need a broad comprehensive instructional program in grades four, five, and six, covering all objectives listed in the Mathematics Framework. Students should not be placed in a repetitive cycle of arithmetic computation practice, but should be exposed to other mathematical concepts and skills throughout their school years. Activities should be provided at all grade levels to develop "number sense" and the ability to use effectively the mathematics students have learned.

- Appropriate mathematical terminology should be used and students should be encouraged to increase their mathematical vocabulary through class and small group problem-solving discussions.

- Students should be encouraged to measure objects to improve their skills in and understanding of measurement using both metric and U.S. Customary units.

- A variety of formats should be used to represent different arithmetic operations: horizontal/vertical, division expressed in fraction form, computer programming format, and so forth.

- Increased emphasis should be placed on recognizing prime numbers, performing prime factorization, and finding least common multiples or greatest common factors.

- Students should be given additional practice in ordering sets of rational numbers in both fraction and decimal form.

- The order of operations should be emphasized in the evaluation of expressions and formulas, and in the solution of equations.

Mathematics Test Results for Grade Twelve

The Survey of Basic Skills: Grade 12 was developed to assess the degree to which students have acquired "basic" mathematics skills by the end of the twelfth grade. A statewide committee compiled objectives and reviewed questions for inclusion in the test. The 198 questions on the Survey were designed to assess students' skills in the areas of arithmetic, algebra, geometry, measurement, and probability and statistics. Figure 4 is an illustration of the emphasis given to each skill area in the total test. In the figure, the skill area of arithmetic is subdivided into the areas of number concepts, whole numbers, fractions, and decimals. A complete description of the skills assessed on the Survey is given in Test Content Specifications, Survey of Basic Skills, Grades 6, 12, Mathematics (Sacramento: California State Department of Education, 1975).

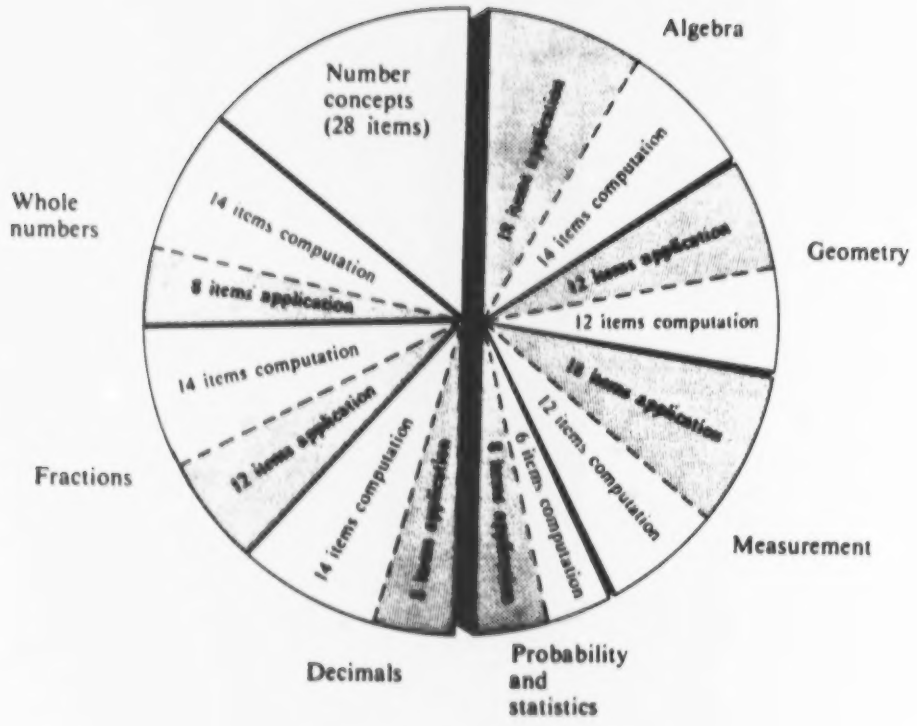


Fig. 4. Number of questions, by skill area, in the mathematics portion of the *Survey of Basic Skills: Grade 12*

Table 28 contains the twelfth grade Survey results for the total test and for the five major content categories assessed on the Survey--arithmetic, algebra, geometry, measurement, and probability and statistics. The results are presented for the computation and application portions of each skill category. Additionally, the results are presented for the category of problem solving, which is an aggregation of application questions in arithmetic, algebra, and measurement. Table 28 shows the scores for 1975-76 through 1983-84 and the changes in scores over the same nine-year period.

Table 28

Mathematics Scores of California Twelfth Grade Students and Changes in Scores on the Survey of Basic Skills: Grade 12, 1975-76 Through 1983-84

Skill area	No. of questions	Average percent correct score									Change in average percent correct score								Total change
		1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1975-76 to 1976-77	1976-77 to 1977-78	1977-78 to 1978-79	1978-79 to 1979-80	1979-80 to 1980-81	1980-81 to 1981-82	1981-82 to 1982-83	1982-83 to 1983-84	1975-76 to 1983-84
MATHEMATICS, TOTAL	198	67.0	66.3	66.3	66.5	66.8	68.0	67.7	67.7	67.4	-0.7	-0-	+0.2	+0.3	+1.2	-0.3	-0-	-0.3	+0.4
Arithmetic	98	72.9	72.1	72.2	72.7	73.1	74.5	74.3	74.4	74.2	-0.8	+0.1	+0.5	+0.4	+1.4	-0.2	+0.1	-0.2	+1.3
Number concepts	28	74.3	73.5	73.6	73.9	74.1	75.4	75.0	75.2	75.1	-0.8	+0.1	+0.3	+0.2	+1.3	-0.4	+0.2	-0.1	+0.8
Number and numeration	14	71.0	70.1	69.9	70.1	70.6	72.1	72.1	72.6	72.9	-0.9	-0.2	+0.2	+0.5	+1.5	-0-	+0.5	+0.3	+1.9
Number theory	8	76.2	75.9	76.4	76.9	76.7	77.7	76.9	76.7	76.0	-0.3	+0.5	+0.5	-0.2	+1.0	-0.8	-0.2	-0.7	-0.2
Number properties	6	79.6	78.5	78.6	78.8	78.7	79.8	79.1	79.3	78.9	-1.1	+0.1	+0.2	-0.1	+1.1	-0.7	+0.2	-0.4	-0.7
Whole numbers	22	80.1	80.1	80.1	80.6	81.0	81.7	81.6	81.6	81.0	-0-	-0-	+0.5	+0.4	+0.7	-0.1	-0-	-0.6	+0.9
Computation	14	80.9	81.0	81.2	81.9	82.4	83.5	83.6	83.8	83.5	+0.1	+0.2	+0.7	+0.5	+1.1	+0.1	+0.2	-0.3	+2.6
Application	8	78.7	78.5	78.2	78.3	78.4	78.6	78.0	77.7	76.6	-0.2	-0.3	+0.1	+0.1	+0.2	-0.6	-0.3	-1.1	-2.1
Fractions	26	66.0	64.5	64.3	64.7	65.0	66.3	66.1	65.9	65.8	-1.5	-0.2	+0.4	+0.3	+1.3	-0.2	-0.2	-0.1	-0.2
Computation	14	70.4	68.3	68.4	69.0	69.6	71.5	71.5	71.2	71.6	-2.1	+0.1	+0.6	+0.6	+1.9	-0-	-0.3	+0.4	+1.2
Application	12	60.9	60.0	59.5	59.6	59.7	60.2	59.9	59.7	59.0	-0.9	-0.5	+0.1	+0.1	+0.5	-0.3	-0.2	-0.7	-1.9
Decimals	22	71.8	71.2	72.0	72.9	73.7	75.8	75.8	76.3	76.2	-0.6	+0.8	+0.9	+0.8	+2.1	-0-	+0.5	-0.1	+4.4
Computation	14	74.1	73.8	74.8	75.8	76.7	79.1	79.2	80.0	80.1	-0.3	+1.0	+1.0	+0.9	+2.4	+0.1	+0.8	+0.1	+6.0
Application	8	67.8	66.6	67.2	67.7	68.3	70.1	69.9	69.8	69.2	-1.2	+0.6	+0.5	+0.6	+1.8	-0.2	-0.1	-0.6	+1.4
Algebra	32	62.9	62.1	61.8	62.1	62.3	63.5	63.2	63.3	63.0	-0.8	-0.3	+0.3	+0.2	+1.2	-0.3	+0.1	-0.3	+0.1
Computation	14	66.4	65.9	65.5	66.0	66.4	67.6	67.5	67.7	67.8	-0.5	-0.4	+0.5	+0.4	+1.2	-0.1	+0.2	+0.1	+1.4
Application	18	60.1	59.2	58.8	59.1	59.1	60.2	59.9	60.0	59.2	-0.9	-0.4	+0.3	-0-	+1.1	-0.3	+0.1	-0.8	-0.9
Geometry	24	62.7	62.1	61.8	61.8	62.0	62.4	62.4	62.1	62.1	-0.6	-0.3	-0-	+0.2	+0.4	-0-	-0.3	-0-	-0.6
Knowledge of facts	12	75.2	75.5	75.5	75.4	75.5	76.0	76.0	75.6	75.6	+0.3	-0-	-0.1	+0.1	+0.5	-0-	-0.4	-0-	+0.4
Application	12	50.1	48.7	48.1	48.3	48.4	48.8	48.8	48.6	48.6	-1.4	-0.6	+0.2	+0.1	+0.4	-0-	-0.2	-0-	-1.5
Measurement	30	60.5	59.5	59.4	59.0	59.2	60.0	59.3	59.0	58.2	-1.0	-0.1	-0.4	+0.2	+0.8	-0.7	-0.3	-0.8	-2.3
Knowledge of facts	12	71.6	70.5	70.1	69.7	69.6	70.8	69.7	69.1	67.8	-1.1	-0.4	-0.4	-0.1	+1.2	-1.1	-0.6	-1.3	-3.8
Application	18	53.1	52.2	52.2	51.9	52.2	52.9	52.4	52.3	51.8	-0.9	-0-	-0.3	+0.3	+0.7	-0.5	-0.1	-0.5	-1.3
Probability and statistics	14	57.2	56.9	57.3	57.4	57.8	59.2	58.8	58.6	58.5	-0.3	+0.4	+0.1	+0.4	+1.4	-0.4	-0.2	-0.1	+1.3
Computation	6	57.9	57.6	58.3	59.0	59.6	61.3	61.3	60.8	61.3	-0.3	+0.7	+0.7	+0.6	+1.7	-0-	-0.5	+0.5	+3.4
Application	8	56.6	56.3	56.5	56.2	56.5	57.6	57.0	56.9	56.5	-0.3	+0.2	-0.3	+0.3	+1.1	-0.6	-0.1	-0.4	-0.1
All application problems	62	61.8	60.7	60.6	60.7	60.9	61.7	61.3	61.2	60.5	-1.1	-0.1	+0.1	+0.2	+0.8	-0.4	-0.1	-0.7	-1.3
Arithmetic	28	68.5	67.2	67.1	67.2	67.5	68.3	67.9	67.7	67.0	-1.3	-0.1	+0.1	+0.3	+0.8	-0.4	-0.2	-0.7	-1.5
Graphs	34	56.2	55.4	55.2	55.3	55.4	56.2	55.7	55.7	55.1	-0.8	-0.2	+0.1	+0.1	+0.8	-0.5	-0-	-0.6	-1.1

Summary of the Committee's Conclusions

The members of the Mathematics Assessment Advisory Committee reviewed the results of the twelfth grade test by skill areas and by items within each skill area. The committee members made the following general remarks about the performance of twelfth grade students in California public schools:

- The overall mathematics achievement of California twelfth grade students decreased from 1982-83 to 1983-84.
- The 1983-84 overall score of 67.4 percent correct was 0.3 of a percent less than the previous year, but was the third highest score for the nine years of testing, being surpassed only by the 1980-81 score of 68.0 and the 1981-82, and 1982-83 scores of 67.7 percent correct.
- Overall, the understanding of the concepts and computational skills in number and numeration has increased over the nine-year period.
- Skill in decimal computation has increased each year since the first year of testing.
- Algebra and algebraic computational skills have increased, and the ability to perform these skills shows improvement.

Instructional Recommendations

The members of the Mathematics Assessment Advisory Committee made the following recommendations for the improvement of mathematics skills in the twelfth grade:

- Since knowledge of facts and applications in measurement scores have decreased consistently, increased instructional emphasis in these areas is recommended. The use of metric units continues to be important and should be included, especially in the secondary school curriculum for all students.
- The achievement in geometry appears to be stabilized, but increased instructional emphasis for all students in this area should be encouraged.
- Increased instructional emphasis in the analysis and solution of problems involving whole numbers, fractions, decimals, and percents, both one-step and multiple-step, is urgently needed.
- The applications of algebra, including solving equations and writing symbolic expressions, continue to be important skills. Because scores in these areas have been decreasing, emphasis should be given to these skills for all students.

Synopsis of Findings for Grade Eight

In the spring of 1983, California eighth grade students were assessed for the first time with the Survey of Academic Skills: Grade 8. The following summary is based on the results of this Survey and the special equating studies conducted to compare the achievement of California students with that of students across the nation:

- Grade eight students, on the average, answered 54.8 percent of the test questions correctly.
- The average grade eight student scored highest on formulation of problems (67.0 percent correct), second highest on order relations (65.6 percent correct), and third highest on analysis of problems (63.3 percent correct).
- The average grade eight student scored lowest on statistics (43.1 percent correct), second lowest on measurement (46.2 percent correct), and third lowest on graphs and functions (47.6 percent correct).
- The median eighth grade student in California is now scoring at the 48th percentile on national norms in mathematics. (See Chapter VIII, "Comparisons with National Norms.")

Committee's Recommendations

After reviewing the results presented in more detail in the next section, the Mathematics Assessment Advisory Committee (members' names and affiliations are listed in the Appendix) offered the following general recommendations:

- Teachers should accurately develop and consistently use the special vocabulary of mathematics in both formal and informal class discussions.
- Balanced instruction in all strands, as recommended in the Mathematics Framework, should occur in all grades, but especially in grades seven and eight.
- Teachers should spend more instructional time on the development of problem-solving skills. The focus of such lessons should frequently be on developing the processes of problem solving. Increasing the number of students directly involved in the discussion of a wide variety of problem-solving strategies and tactics is also necessary if the student's ability to analyze, solve, and interpret solutions of problems is to improve.

- The understanding and use of data analysis is a vital component of everyone's life. Elementary data analysis, statistics, and probability, along with appropriate terminology, should become part of the basic components of the mathematics curriculum in grades seven and eight.

- More instructional emphasis should be given to the development of informal geometric understandings and the use of mensuration formulas for common two- and three-dimensional figures.

- A substantial upgrading of the mathematics curriculum and the expected level of student achievement in grades seven and eight must occur. The overall average percent correct score of 54.8 was considered by the Mathematics Assessment Advisory Committee to be unsatisfactory.

Scope of the Grade Eight Mathematics Test

The new Survey of Academic Skills: Grade 8 was first administered in the spring of 1983. It assesses the levels of mathematical skills of eighth grade students in California on a comprehensive set of subskills and is similar in breadth to the new Survey of Basic Skills: Grade 6 that was first used in 1981-82. The development and review process that spanned a period of several years included a large number of California teachers, students, and schools. The result of this process was a comprehensive set of test specifications and the 468 items that appear on the Survey.

The 468 items on the Survey were designed to assess students' skills in the areas of numbers; operations; algebra; geometry; measurement; probability and statistics; tables, graphs, and integrated applications; and problem solving. Figure 5 illustrates the emphasis placed on each skill area in the total test. The emphasis on each skill area in the test is consistent with the mathematics curriculum of most California public schools and additionally reflects the curriculum recommended by the Mathematics Framework. A detailed description of the skills assessed in the eighth grade Survey is given in Survey of Academic Skills: Grade 8--Rationale and Content.

Mathematics Results for Grade Eight

The results of the new eighth grade mathematics assessment for 1983-84 are shown in Table 29. Since the 1983-84 assessment was the first administration of the eighth grade test, no longitudinal comparisons can be made between

this year's scores and previous years' scores. The scores on this new Survey will serve as a base line for comparing skill-by-skill results in subsequent years. Thus, Table 29 provides an initial profile of statewide student performances for eighth grade students in California.

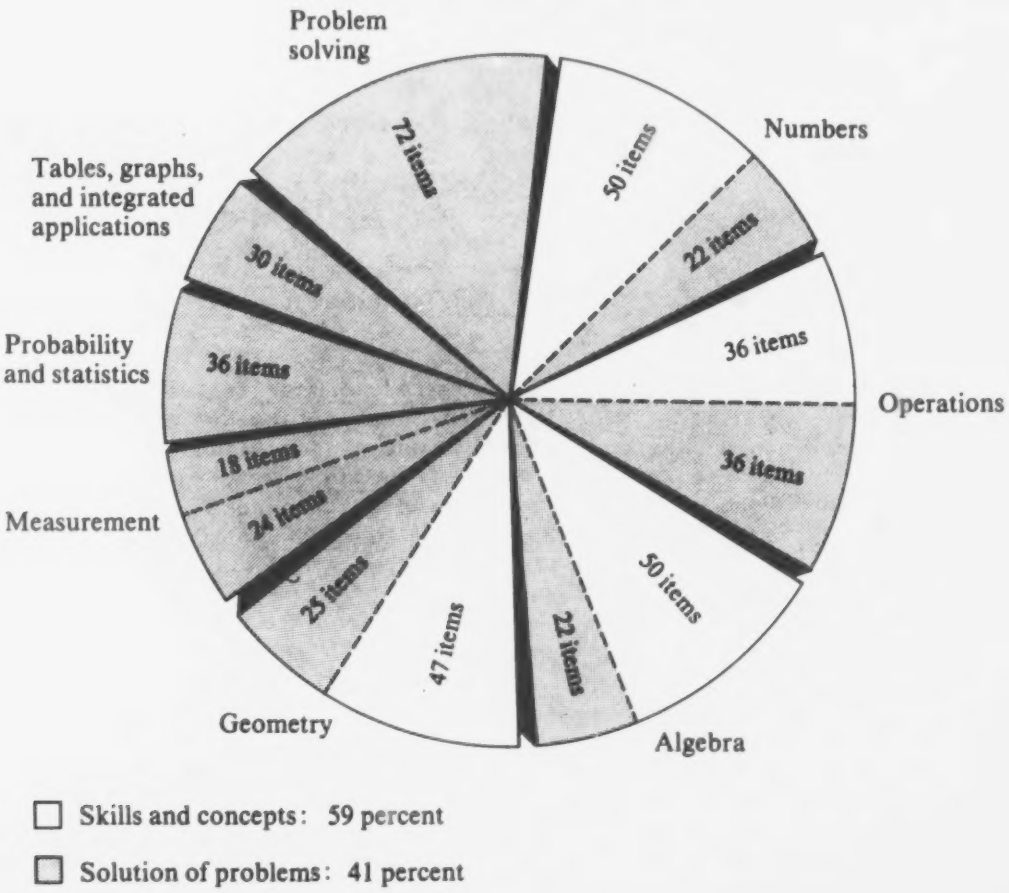


Fig. 5. Number of questions, by skill area, in the mathematics portion of the *Survey of Academic Skills: Grade 8*

Table 29 shows that California eighth grade students had an average percent correct score of 54.8 on the 468 questions in the total test. From Table 29, the following conclusions are apparent:

- Eighth grade students typically scored higher on skills questions than on application questions, with the exception of the geometry category.

- The lowest average percent correct scores in the eight major skill areas were in probability and statistics (45.2 percent correct); measurement (48.5 percent correct); and geometry (49.9 percent correct).

Table 29

Mathematics Scores of California Eighth Grade Students on the Survey of Academic Skills: Grade 8, 1983-84

Skill area	Number of questions	Average percent correct score, 1983-84
MATHEMATICS, TOTAL	468	54.8
Numbers	72	58.8
Skills and concepts	50	58.8
Order relations and classification	15	65.6
Number theory	20	55.8
Properties	15	56.0
Applications	22	58.7
Operations	72	57.5
Skills/concepts	36	60.4
Whole and rational numbers	22	61.4
Percents	14	58.8
Applications	36	54.6
One-step	20	57.5
Two or more steps	16	51.0
Algebra	72	51.8
Skills and concepts	50	50.9
Expressions, equations, and inequalities	30	53.2
Graphs and functions	20	47.6
Applications	22	53.8
Geometry	72	49.9
Skills and concepts	47	49.3
Geometric terms and figures	20	50.5
Relationships	27	48.4
Applications	25	51.1
Measurement	42	48.5
Skills and concepts	24	50.3
Units and estimation	12	52.4
Perimeter, area, volume	12	48.1
Applications	18	46.2
Probability and statistics	36	45.2
Probability	18	47.4
Statistics	18	43.1
Tables, graphs, and integrated applications	30	60.5
Tables and graphs	15	61.5
Integrated applications	15	59.5
Problem solving	72	61.9
Formulation of a problem	14	67.0
Analysis of a problem	20	63.3
Applying strategies	24	61.2
Reasoning and interpretation	14	56.2
Solution of problems	261	55.4

- The highest average percent correct scores in the eight major skill areas were in problem solving (61.9 percent correct); tables, graphs, and integrated applications (60.5 percent correct); and numbers (58.8 percent correct).

- The highest average percent correct score in the applications sections occurred in the integrated applications (59.5 percent correct). These applications involve the functional transfer of mathematical skills and concepts to the solution of problems related to everyday life situations.

Committee's Analysis of Skill Area Results

The members of the Mathematics Assessment Advisory Committee reviewed the results of the eighth grade assessment by skill area and by items within each skill area. The results of the committee's analysis are summarized below, by major skill area. Illustrative examples indicating students' actual performance are provided to indicate areas of special strengths or weaknesses; however, these examples should not be taken as indicative of the typical student performance in an entire skill area.

Numbers and Operations

Overall, students did reasonably well, scoring above the test average of 54.8 percent correct in all subskills of numbers and operations. Order relations and classification of numbers was highest, with an average percent correct score of 65.6. The committee was pleased to note that a strong foundation existed for future improvement and development and noted the following areas of relative strength:

- Identification of odd, even, and prime numbers; composites; factors; and multiples

- Identification of missing numerals that illustrate identity or inverse elements of the number system

- Understanding of the addition, subtraction, and multiplication algorithms

- Adding and multiplying fractions and decimal numbers

- Simple percent calculations

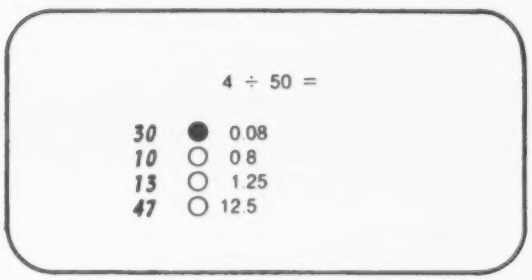
- Single-step word problems that did not involve having to select the operation

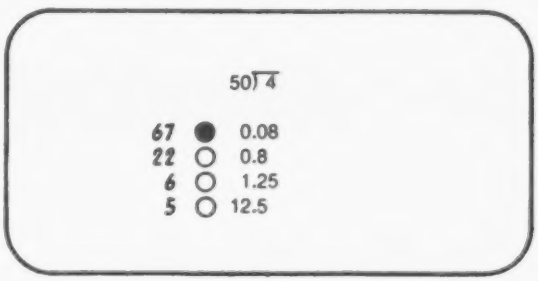
- Single-step word problems involving fractions and ratios

Students' scores on items involving operations with decimals have shown a significant improvement over last year's scores at the third, sixth, and twelfth grades.

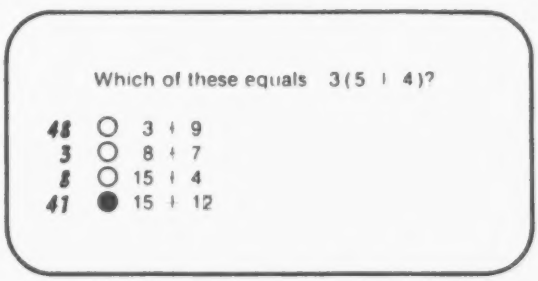
Some areas of relative weakness were noted in the skill areas of numbers and operations. These weaknesses indicate that additional instructional emphasis should be given to the development of student understanding of concepts and skills and that rote practice of rules and procedures is not sufficient for increasing the performance of students. The committee recommended that teachers review the following areas of relative weakness and provide students with experiences that help develop a better understanding of the identified skills and concepts:

- Students were able to use the division format $50\overline{)4}$, but not $4 \div 50$. Students should be introduced to a variety of computational formats.





- Students showed a lack of understanding of the properties of whole numbers. The committee did not recommend a return to rote learning of the terminology and manipulations of number properties, but did suggest that understanding of the usefulness of these basic concepts will enhance students' mathematical power:



- The committee recommended the development of rounding and estimation techniques that can promote better comprehension and skill in the division of decimals and the correct placement of the decimal point in a quotient.

- In the problems involving the relationships between fractions, decimals, and percents, the committee noted that comparable application items often had higher scores than the skill items, reinforcing the committee's opinion that skills taught or used in a familiar context are understood better.

What is 100% of 32?

29	○	0.32
50	●	32
7	○	132
14	○	3200

$\frac{5}{10}$ =

8	○	0.05%
40	○	0.5%
13	○	5%
39	●	50%

100 percent of the 32 students in a class know how to do long division. How many students know long division?

21	○	0.32
67	●	32
6	○	132
6	○	3200

- The important concepts and prealgebra skills involving multiples, common factors, divisors, and divisibility need additional instructional emphasis at the eighth grade level.

Which of these is the least common multiple (LCM) of 6 and 8?

47	○	2
6	○	8
36	●	24
11	○	48

- Estimation of products and quotients is weak, including the need for a consistent development of estimation and mental arithmetic skills.

Which of the following is the greatest?

2 ○ −2
70 ● 0
19 ○ −3
9 ○ $-\frac{1}{2}$

$(3 \times 10) + (5 \times 10) =$

14 ○ $(3 \times 5) + (2 \times 10)$
55 ● $(3 + 5)10$
15 ○ $(3 + 5)(10 + 10)$
16 ○ $(3 \times 5)10$

- Understanding of negative numbers, exponents, and square roots showed a need for improvement. Students who enter beginning algebra courses will be greatly handicapped without a thorough understanding of the concepts and skills related to these topics.

$(6 \times 10^2) + (4 \times 10^1) + (5 \times 10^0) =$

54 ● 645
7 ○ 641
33 ○ 640
6 ○ 64.5

Which shows the **prime factorization** of 24?

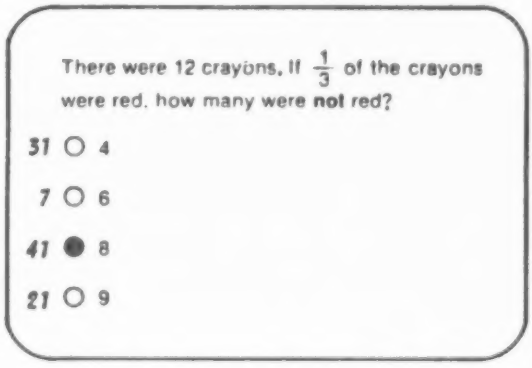
33 ● $2^3 \times 3$
35 ○ 1×24
7 ○ $2^2 \times 3^3$
25 ○ $2^2 \times 6$

Which is the integer closest to $\sqrt{150}$?

19 ○ 10
27 ● 12
38 ○ 15
16 ○ 20

- Scores on multiple-step word problems were low, especially those involving percents and decimal numbers. Students will need to develop analysis and problem-solving skills far beyond that provided by most textbooks in order to successfully solve problems involving two or more steps.

- The format of some word problems caused errors in what were basically simple two-step problems. The committee recommends that students be given practice in posing and answering questions that are the reverse or complement of usual questions. For example, if the problem says, "Two of the ten marbles were blue and five were green," students should be able to verbalize several questions, including, "How many were not green or blue?" as well as, "How many were green or blue?"



Algebra

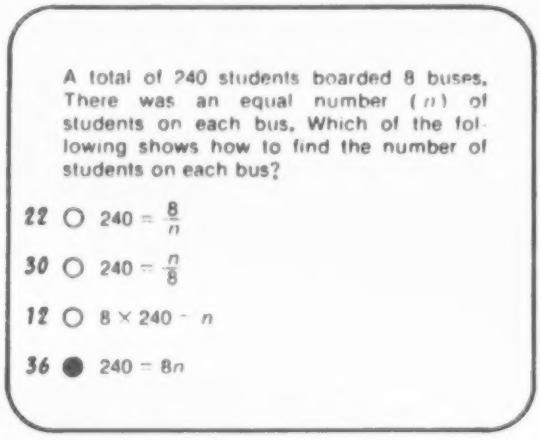
The questions in the algebra part of the Survey involve translation of simple English phrases and sentences into algebraic expressions, equations, and inequalities and, conversely, the evaluation of simple expressions involving one or more operations, standard order of operations, operations with integers, solution of simple equations, identification of points in the coordinate plane, identification of missing numbers or function rule from a given function table, identification of the graph of a linear equation, identification of standard formulas, and the solution of word problems related to some of the above topics.

The committee noted the following areas of relative strength in the skill area of algebra:

- Students can simplify computational problems that have parentheses.
- Students can translate simple word problems to algebraic equations if the problems involve whole numbers.
- Girls do better than boys, in general, on problems involving graphs.
- Students can evaluate given formulas.

The committee noted the following areas of relative weakness in this skill area:

- Students need more instructional emphasis on recognizing the correct order of operations in computational problems.
- Students are not familiar with the vocabulary of mathematics and need more instructional emphasis to develop an understanding of words such as product, factor, sum, and so forth.
- Students need more instructional emphasis in the translation of word problems that involve rational numbers.


A total of 240 students boarded 8 buses. There was an equal number (n) of students on each bus. Which of the following shows how to find the number of students on each bus?
22 ○ $240 = \frac{8}{n}$
30 ○ $240 = \frac{n}{8}$
12 ○ $8 \times 240 = n$
36 ● $240 = 8n$

- Students do poorly on finding the solution of equations that involve rational numbers in fraction form.
- Eighth grade students have more difficulty identifying coordinates of points in the coordinate plane than do sixth grade students.
- Students have difficulty in selecting operations necessary to solve problems if they involve two or more steps.
- Students have difficulty in solving a given formula for a selected variable, especially if more than one step is required.

Geometry

The questions in the geometry part of the Survey involve the identification of two-dimensional geometric figures; geometric terms; triangles; angles; approximate measure in degree of angles; parallel or perpendicular lines and planes; figures that are congruent, similar, or symmetrical; spatial transformations; basic geometric postulates; and applications involving the above topics.

The committee identified the following areas of relative strength in the area of geometry:

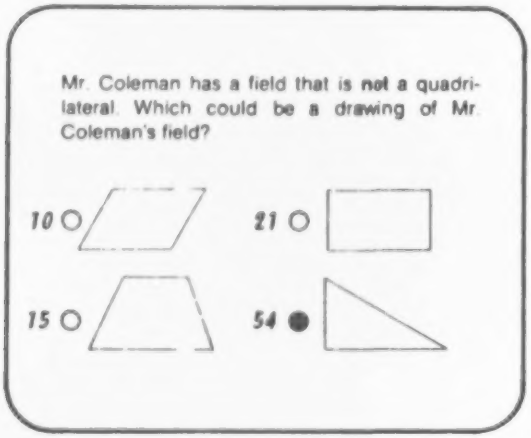
- Visualization of three-dimensional figures
- Identification of one-step illustrations of congruence of common geometric figures

The committee identified the following areas of relative weakness in this skill area:

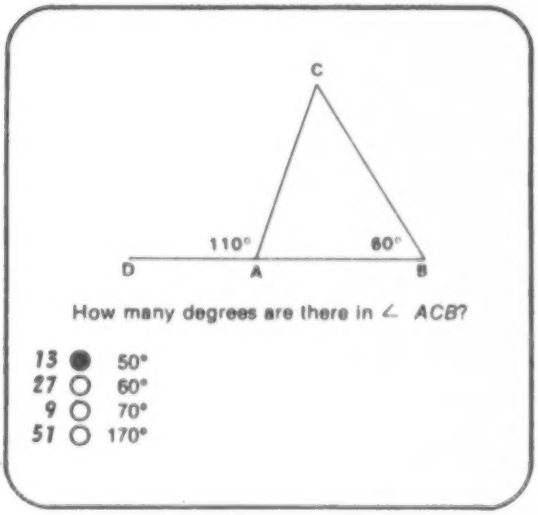
- Identification of various kinds of triangles
- Identification of the measures of special angles and the sum of the measures of the angles of a triangle
- Understanding of the proportionality of corresponding parts of similar figures
- Identification of the congruence of figures when they are placed in nonstandard positions

The committee made the following recommendations for improving performance in this skill area:

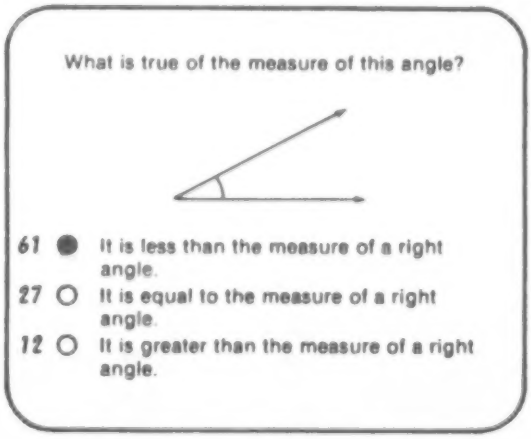
- Increased instructional emphasis should be given in the appropriate use of geometric terminology.



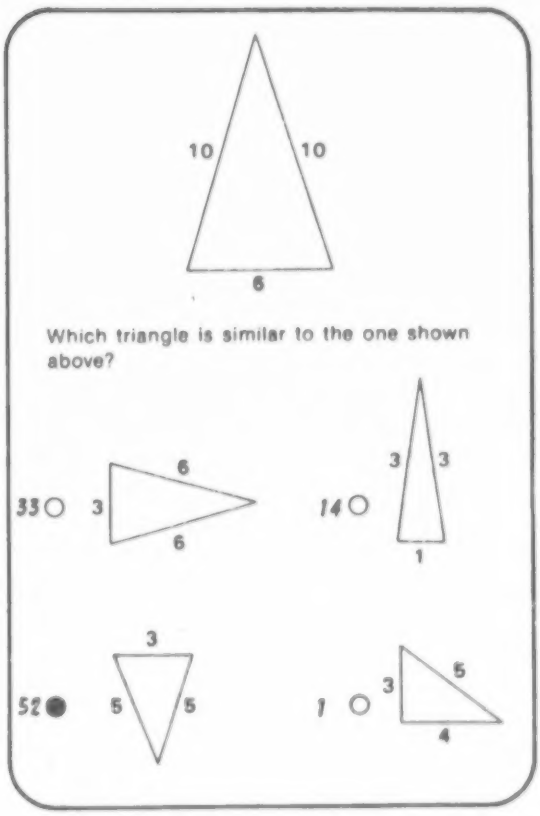
- Increased instructional emphasis should be given to developing the understanding of the relationships involving the sum of the measures of the angles of a triangle, the measures of exterior angles, and the measures of angles about a vertex.



- Increased instructional emphasis should be placed on the recognition of special angles such as right angles, straight angles, acute angles, obtuse angles, and so forth.


What is true of the measure of this angle?
61 ● It is less than the measure of a right angle.
27 ○ It is equal to the measure of a right angle.
12 ○ It is greater than the measure of a right angle.

- Increased instructional emphasis on relationships involving similar figures that stress the proportionality of their corresponding parts.



Measurement

The questions in the measurement part of the Survey involve the estimates of the measures of familiar objects in U.S. Customary or nonstandard units; the estimates of measures of objects in metric units; identification of equivalent measures in U.S. Customary and metric units; calculation of equivalent measures given basic conversion tables; identification of formulas for perimeter, area, and volume of common geometric figures; and calculation of perimeter, circumference, area, and volume of common geometric figures.

The committee identified the following areas of relative strength in the area of measurement:

- Students were able to estimate the measurement of common objects using standard units of measure.

Which object is approximately 15 feet long?

9	○	a bicycle
84	●	an automobile
1	○	a shoe
6	○	a baseball bat

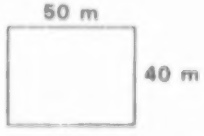
About how much would a whole Thanksgiving turkey weigh?

1	○	2 oz.
10	○	2 lbs
5	○	12 oz.
84	●	12 lbs

Which object would be about 3 centimeters long?

11	○	a pen
3	○	a book
84	●	a paper clip
2	○	a desk

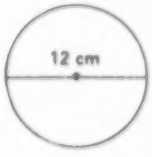
- Boys' performance exceeded girls' performance on 32 of the 42 items in this skill area. On items requiring direct calculation, girls' scores exceeded the boys' scores.



Area = length × width

What is the area of a rectangle that is 50 meters by 40 meters?

	B	G
● 2000 square meters	60	64
○ 200 square meters	15	12
○ 180 square meters	14	14
○ 90 square meters	11	10



$C = \pi d$

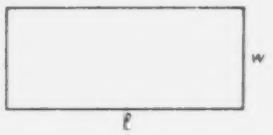
$\pi = 3.14$

What is the circumference of this circle?

	B	G
○ 15.14 cm	13	12
○ 18.84 cm	19	16
● 37.68 cm	63	68
○ 75.36 cm	5	4

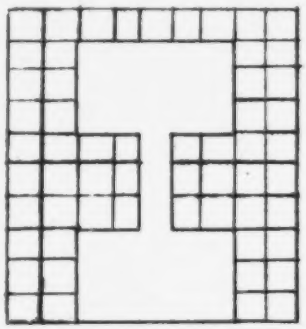
The committee identified these areas of relative weakness in the area of measurement:

- Confusion between perimeter measure and area measure



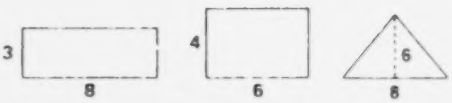
What is the formula for the perimeter, P, of a rectangle with length, ℓ, and width, w?

8 ○ $P = \frac{1}{2}(\ell + w)$
44 ○ $P = \ell \times w$
8 ○ $P = 2\ell + w$
40 ● $P = 2\ell + 2w$



What is the perimeter of this figure?

7 ○ 45 units
11 ○ 40 units
25 ● 36 units
58 ○ 33 units



Which of the following statements is true of the figures above?

36 ● The areas are the same
25 ○ The perimeters are the same
18 ○ The sides are of the same length.
21 ○ Both the areas and the perimeters are the same

o Conversion between metric measures of equivalent value

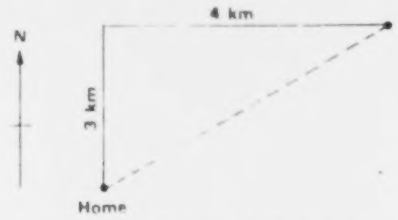
How would you change 6 meters to millimeters?

30 ○ multiply by 0.001
25 ○ multiply by 0.01
19 ○ multiply by 100
26 ● multiply by 1000

474 mm =

20 ○ 4740 cm
41 ● 47.4 cm
25 ○ 4.74 cm
14 ○ 0.474 cm

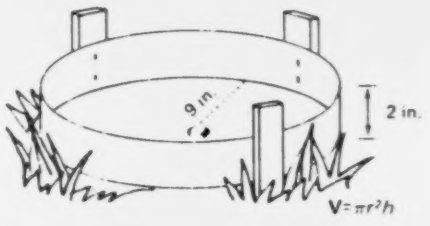
o Lack of knowledge of the Pythagorean relationship



The club members hiked 3 kilometers north and 4 kilometers east, but then went directly home, as shown by the dotted line. How far did they travel to get home?

10 ○ 4 km
31 ● 5 km
20 ○ 6 km
39 ○ 7 km

o Lack of knowledge of the approximate values of pi



Ramon is pouring concrete stepping stones. Each circular form is approximately 2 inches deep and has a 9-inch radius. About how many cubic inches of concrete will he need for each form?

21 ○ 50 cu. in.
42 ○ 160 cu. in.
18 ○ 250 cu. in.
19 ● 500 cu. in.

The committee made the following recommendations for improvement of performance in this skill area:

- **Increase the instructional emphasis on the skill of converting between units of measure in the same system.**

- Increase the instructional emphasis on the development of the understanding of the difference between perimeter, area, and volume and skill in calculating those values for common geometric figures.

- Increase the instructional emphasis on life skill problems involving volume.

Probability and Statistics

The questions in the probability and statistics part of the Survey involve identification of the probability of an event or the complement of an event; an event that is certain to occur or certain not to occur; independent events; the probability from a sample of observed outcomes; determination of the number of outcomes of an event; use of the fundamental counting rules; identification of the mean, median, mode, and range of a given set of data; and identification of the frequency of an event from a given set of data.

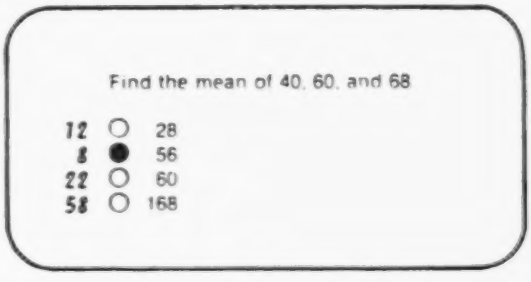
The committee identified the following areas of relative strength in the area of probability and statistics:

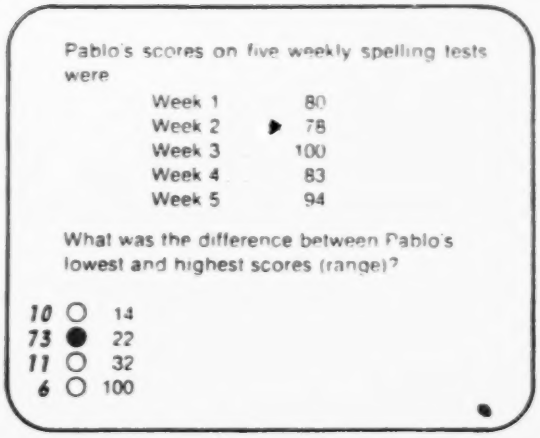
- Students' performance on items involving probability was good.

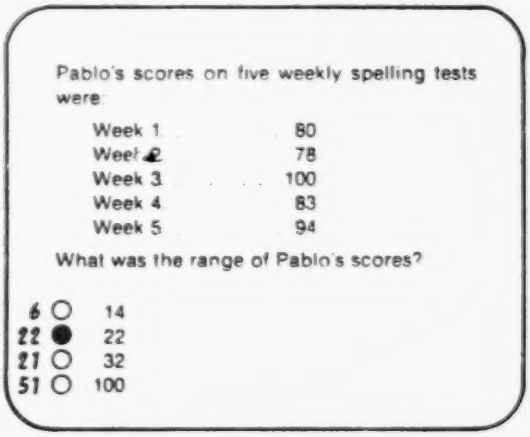
- Eighth grade students do better on items involving "average" than do sixth grade students.

The committee identified the following areas of relative weakness in this skill area:

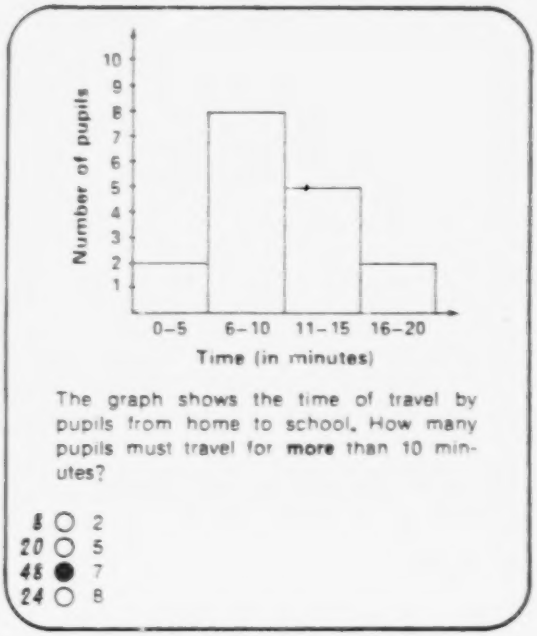
- Students do not understand the vocabulary of statistics, such as range, median, mode, mean, and frequency distribution.




Pablo's scores on five weekly spelling tests were
Week 1 80
Week 2 78
Week 3 100
Week 4 83
Week 5 94
What was the difference between Pablo's lowest and highest scores (range)?
10 ○ 14
73 ● 22
11 ○ 32
6 ○ 100



- Students need more instructional emphasis on problems involving frequency distributions.



The graph shows the time of travel by pupils from home to school. How many pupils must travel for **more** than 10 minutes?

8 ○ 2
20 ○ 5
48 ● 7
24 ○ 8

Test score	Tally	Frequency
4	/	1
5	///	3
6	//// /	6
7	//	2
8	////	4
9	///	3
10	/	1

A table shows scores for a class on a 10-point test. How many in the class made a score **greater** than 7?

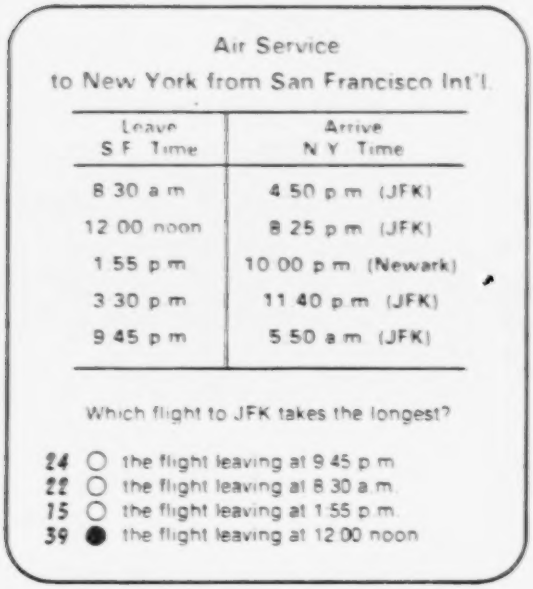
60 ● 8
26 ○ 10
8 ○ 12
6 ○ 20

Tables, Graphs, and Integrated Applications

The questions in the tables, graphs, and integrated applications part of the Survey include the interpretation of information given in the form of a line, bar, circle, or pictorial graphs and the interpretation of information from maps, road signs, advertisements, and commercial charts, tables, or schedules.

The committee identified the following relative weaknesses in this skill area:

- Students misinterpret percentage problems, especially when asked to find the original amount from which a percent was extracted.
- Students have considerable difficulty in reading and interpreting commercial graphs, charts, schedules, and tables.



Air Service
to New York from San Francisco Int'l.

Leave S.F. Time	Arrive N.Y. Time
8:30 a.m.	4:50 p.m. (JFK)
12:00 noon	8:25 p.m. (JFK)
1:55 p.m.	10:00 p.m. (Newark)
3:30 p.m.	11:40 p.m. (JFK)
9:45 p.m.	5:50 a.m. (JFK)

Which flight to JFK takes the longest?

24 ○ the flight leaving at 9:45 p.m.
22 ○ the flight leaving at 8:30 a.m.
15 ○ the flight leaving at 1:55 p.m.
39 ● the flight leaving at 12:00 noon

Problem-Solving Analysis

Problem solving is considered to be such an important area that more than 50 percent of the eighth grade Survey is devoted to this area. To assess students' performance in problem-solving skills, the committee incorporated several unique design features into the new Survey. First, the test contains questions on applications as well as skills for each major strand of mathematics. Second, the test includes matched questions--that is, a computational question and its parallel in a word problem involving the same computations. Third, problem-solving questions unique to the California Assessment Program were written by committee members to assess achievement in problem formulation, analysis, strategies, and reasoning and interpretation. Fourth, several application and problem-solving questions were assessed at both the sixth grade and eighth grade levels to provide a basis for longitudinal analysis. Fifth, integrated applications, also unique to the California Assessment Program, are intended to assess skills involving knowledge in two or more mathematics skills in a practical situation.

Problem solving is reported in five categories. The first four--problem formulation, analysis, strategy, and reasoning and interpretation--assess the processes of problem solving. These items require students to think about a problem situation; the correct response is not simply the answer to an arithmetic computation. The fifth category--solution--is an aggregation of all application items of the other strands plus probability and statistics and tables, graphs, and integrated application problems. How well students solved these application problems is discussed in each of the strand areas.

The average percent correct on problem-solving items is slightly higher than the scores in the other areas. However, it cannot be assumed that eighth grade students are more skillful in solving problems. The problem solving may have been somewhat easier than items in the other content strands.

Of the four categories that examine the process of problem solving, students were strongest in formulation of problems. The skills in the category include identifying problems or situations that can be represented by given mathematical models, such as number sentences, equations, diagrams, tables, and graphs. Many of these items require only a basic recognition or simple translation of the parts of a problem. The following example illustrates the performance of eighth grade students on a question in problem formulation:

Which problem can be illustrated by the diagram above?

68	●	Carmen earned $12 and spent $5. How many dollars does she have left?
11	○	Jose lived 15 blocks from school. How long did it take him to walk to school?
15	○	Tanya had 7 marbles. She bought 8 more marbles. How many did she have then?
6	○	Niki ate 5 lemon drops. She gave lemon drops to Pearl. How many did she have left?

Analysis of a problem involves identifying the significant features of the problem, including facts and appropriate, extraneous, or incomplete information; clarifying ideas within a problem in a simpler form; identifying similarities and differences in two sets of information; and identifying problems with the same underlying mathematical processes. In this area, students performed relatively better on items in which they had to identify additional information that would be needed to solve a given problem. Students did less well when they were required to categorize problems in terms of arithmetic operation. For example, in the item below, the operation, subtraction, is specified in the stem:

The target of a ball throwing contest was 50 meters away. The best throw was 12 meters short. To find the length of the throw, Steve subtracted 12 meters from 50 meters and got 38 meters.

Which of the following problems can be solved using the same steps?

60 ● Steve had $10 and spent $2. How much money did he have then?

15 ○ Steve had $10 and earned $2 more. How much money did he have then?

17 ○ Steve had $10 and shared it with 2 friends. How much money did he have then?

8 ○ Steve had $10 and got twice as much the next day. How much money did he have then?

Each distractor is a very elementary word problem (one for each operation) that uses the same small numbers and can be easily calculated mentally. Yet, only 60 percent of the eighth grade students answered this item correctly. Although the committee realizes that students probably have had few experiences in categorizing problems in terms of operation, the simple nature of the given problem and the distractors is such that a higher percent of the students should be getting this item correct.

Strategy problems require the students to use estimation, identify appropriate mathematical models, or identify other appropriate strategies such as drawings, diagrams, tables, or charts that will lead to the solution of a given problem. The following example illustrates how many students frequently will ignore critical information (e.g., changing feet to yards) and select the most obvious one-step computation when solving problems:

It takes 4 **feet** of string to tie each bundle of newspapers. There are 15 bundles to tie. Which would tell you how many **yards** of string are needed?

45 ● Multiply 4 by 15 and divide the answer by 3.

39 ○ Multiply 4 by 15.

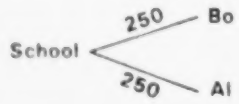
8 ○ Multiply 4 by 15 by 3.

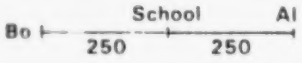
8 ○ Multiply 3 by 15 and divide the answer by 4.

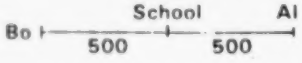
Ignoring critical elements in a problem also is apparent in the following example, which requires the students to interpret a drawing:

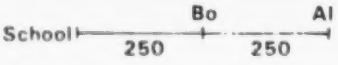
Bo and Al lived the same distance from the school, but in opposite directions. They found that they lived 500 meters apart.

Which drawing shows this?

10 ○ 

62 ● 

26 ○ 

2 ○ 

The most difficult problem-solving process category for eighth grade students involved reasoning and interpretation problems. These items required the students to interpret solutions to problems and to identify assumptions implicit in this interpretation. The following example illustrates that only slightly more than half the students could identify a reasonable conclusion to a fairly simple one-step word problem:

A new school building has 40 classrooms. The school ordered 28 new desks for each classroom. A total of 1,200 desks were delivered.

Which of the following statements is true?

11 ○ The correct number of desks was delivered.
54 ● Too many desks were delivered
32 ○ Not enough desks were delivered
3 ○ The school needed 200 more desks

The preceding example is one of the few items that was on both the sixth and eighth grade tests in which sixth graders performed better (58 percent of sixth graders got this item correct compared with 54 percent of the eighth graders). Twenty problem-solving process problems were included in both the sixth grade and eighth grade tests. On the average, the percentage of students getting an item correct increased 8 percentage points between sixth and eighth grades.

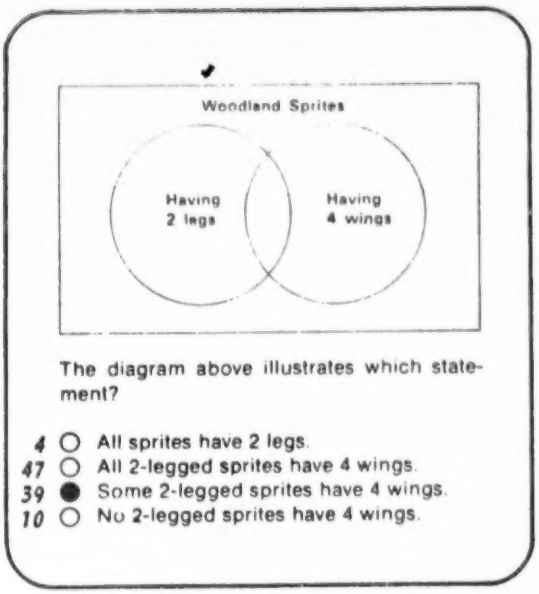
In general, reading comprehension did not seem to be a major factor affecting the difficulty of items. An example of an item that indicates that students are reading problems carefully and making critical interpretation of the information given in the problem is the following:

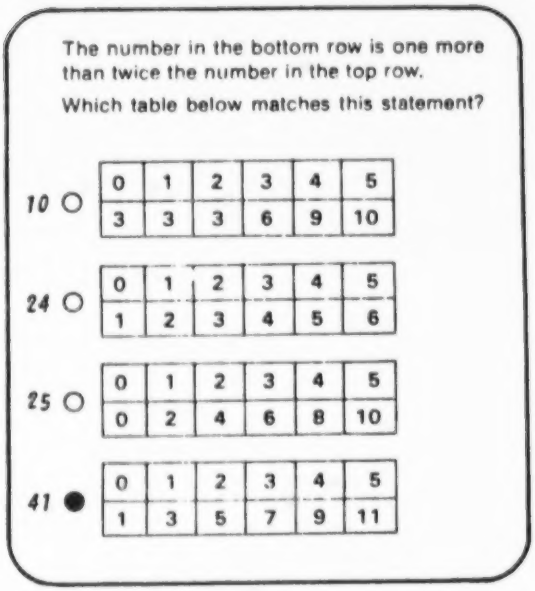
The Blayton School Booster Club sponsored a dinner to benefit the school track team. The food was prepared and served by 27 members. A total of 189 people bought tickets for $12 each. The cost of each person's dinner was $7.58. In addition, it cost the Club $225 for other expenses. How much profit was made for the team?

What information is **not** needed to solve this problem?

73	●	the number of people who prepared and served the meals
10	○	the number of people who bought tickets
5	○	the cost of each person's dinner
12	○	the amount of the other expenses

However, students tended to perform poorly on items that required interpretation of a Venn diagram or tables of functional relationships, as shown in the following examples:


Woodland Sprites
Having 2 legs
Having 4 wings
The diagram above illustrates which statement?
4 ○ All sprites have 2 legs.
47 ○ All 2-legged sprites have 4 wings.
39 ● Some 2-legged sprites have 4 wings.
10 ○ No 2-legged sprites have 4 wings.


The number in the bottom row is one more than twice the number in the top row.
Which table below matches this statement?
10 ○
0 1 2 3 4 5
3 3 3 6 9 10
24 ○
0 1 2 3 4 5
1 2 3 4 5 6
25 ○
0 1 2 3 4 5
0 2 4 6 8 10
41 ●
0 1 2 3 4 5
1 3 5 7 9 11

Although the format of these items may not be as familiar to students, the committee feels that the items embody some important mathematical concepts.

The committee recommends that teachers spend more instructional time on problem-solving skills. The focus of the lessons frequently should be on developing the processes of problem solving rather than on just obtaining correct solutions. Encouraging student discussion of a variety of approaches and strategies can facilitate students' ability to analyze and interpret a variety of problems.

National and International Comparisons of Eighth Grade Achievement

In conjunction with the grade eight assessment in 1983-84, the California Assessment Program conducted a study to compare mathematics achievement of California students with that of representative national and international samples of eighth grade students. The comparison was accomplished using test questions from the second international study of mathematics sponsored by the International Association for the Evaluation of Educational Achievement (IEA).

In 1964 the IEA, a nonprofit international organization based in Stockholm, conducted the first cross-national study in six subject areas, including mathematics. Nearly 20 years later, in 1981-82, IEA conducted a second international study in mathematics, which included 21 countries and Hong Kong. In addition to the United States, Japan, and Canada, the countries that participated were Australia, Belgium, Chile, England, Finland, France, Hungary, Ireland, Israel, Ivory Coast, Luxembourg, the Netherlands, New Zealand, Nigeria, Scotland, Swaziland, Sweden, and Thailand.

For each subject an international group of scholars writes an examination, and a committee is formed in each country to conduct the research in its schools. The American section of the study was coordinated by the University of Illinois at Urbana-Champaign and financed by the National Institute of Education, the National Science Foundation, and the National Center for Educational Statistics.

The second international study was targeted at eighth and twelfth grade students. The study was designed to provide detailed information from participating countries about (1) the content of mathematics curricula; (2) how mathematics is taught; and (3) how much mathematics students learn. Tests and questionnaires were administered to 7,500 eighth graders and 6,000 high school seniors in a sample of 600 public and private school classrooms across the United States. The CAP study focused on the level of student learning at the eighth grade; the study did not compare curricula or how mathematics is taught.

To compare the achievement of California eighth grade students with those of the IEA national and international samples, CAP used a sample of IEA questions to construct three "research" forms. The IEA study included five unique test forms--a core and four rotated forms. In the international study all students took the core test and one or more of the rotated forms. The core test consisted of representative skills from all domains of mathematics except statistics. The core test consisted of 40 questions--16 in arithmetic (eight in decimals and fractions and eight in proportion and percent), eight in algebra, eight in geometry, and eight in measurement. These 40 questions were divided into three parts for inclusion on CAP's three "research" forms. The research forms were administered between April 25 and May 25, 1983. On each of the three research forms, data were obtained from approximately 1,000 students.

The U.S. findings of the second international mathematics study are given in the Second Study of Mathematics--Summary Report, United States (published by the U.S. Coordinating Center, University of Illinois at Urbana-Champaign, 398 Education Building, 1310 South Sixth Street, Champaign, IL 61820, September 1984). Table 30 summarizes the mean achievement in mathematics of the U.S. students and the achievement of international students participating in the study. Figures 6 through 10 summarize the achievement of the U.S. students in five major skill areas of mathematics together with the achievement of students in the other participating countries. In the figures the only countries identified are those whose national reports are available at this time. A marker has been added to the figures to indicate the point representing the achievement level of California students.

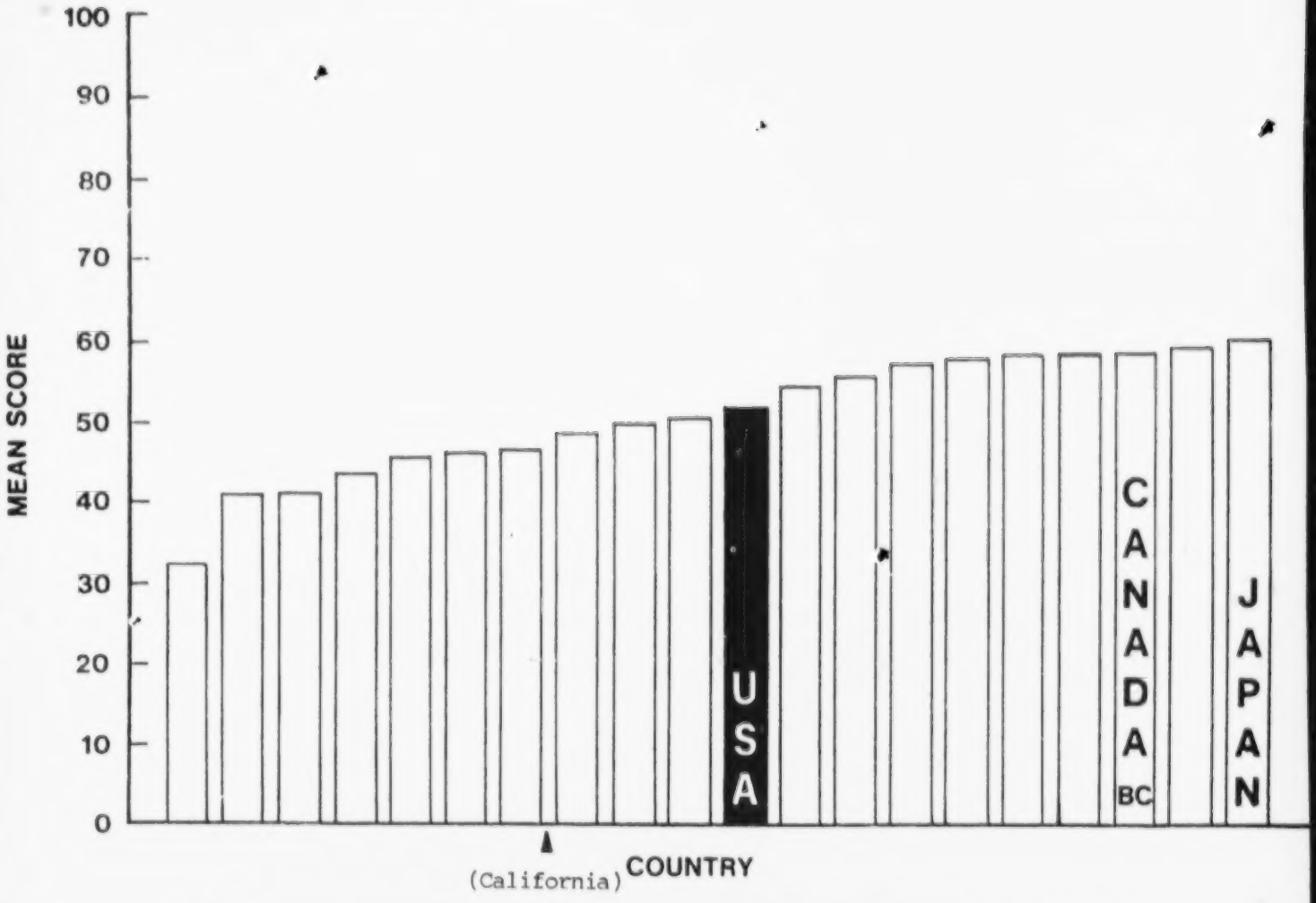


Fig. 6. Mean achievement in arithmetic for population A (eighth grade in U.S.) for 20 countries

SOURCE: Second Study of Mathematics--Summary Report, United States. Champaign, IL: University of Illinois at Urbana-Champaign, 1984.

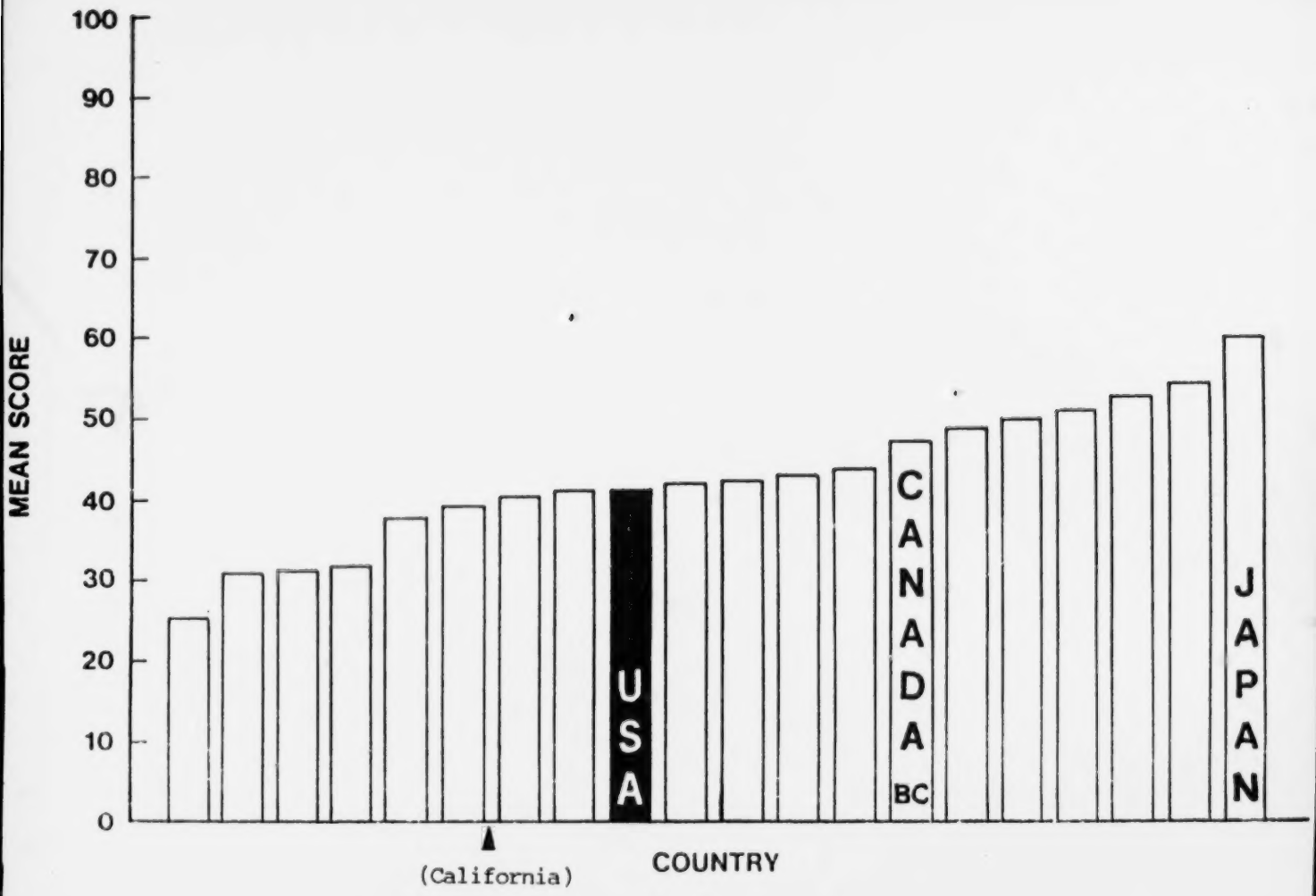


Fig. 7. Mean achievement in algebra for population A (eighth grade in U.S.) for 20 countries

SOURCE: Second Study of Mathematics--Summary Report, United States. Champaign, IL: University of Illinois at Urbana-Champaign, 1984.

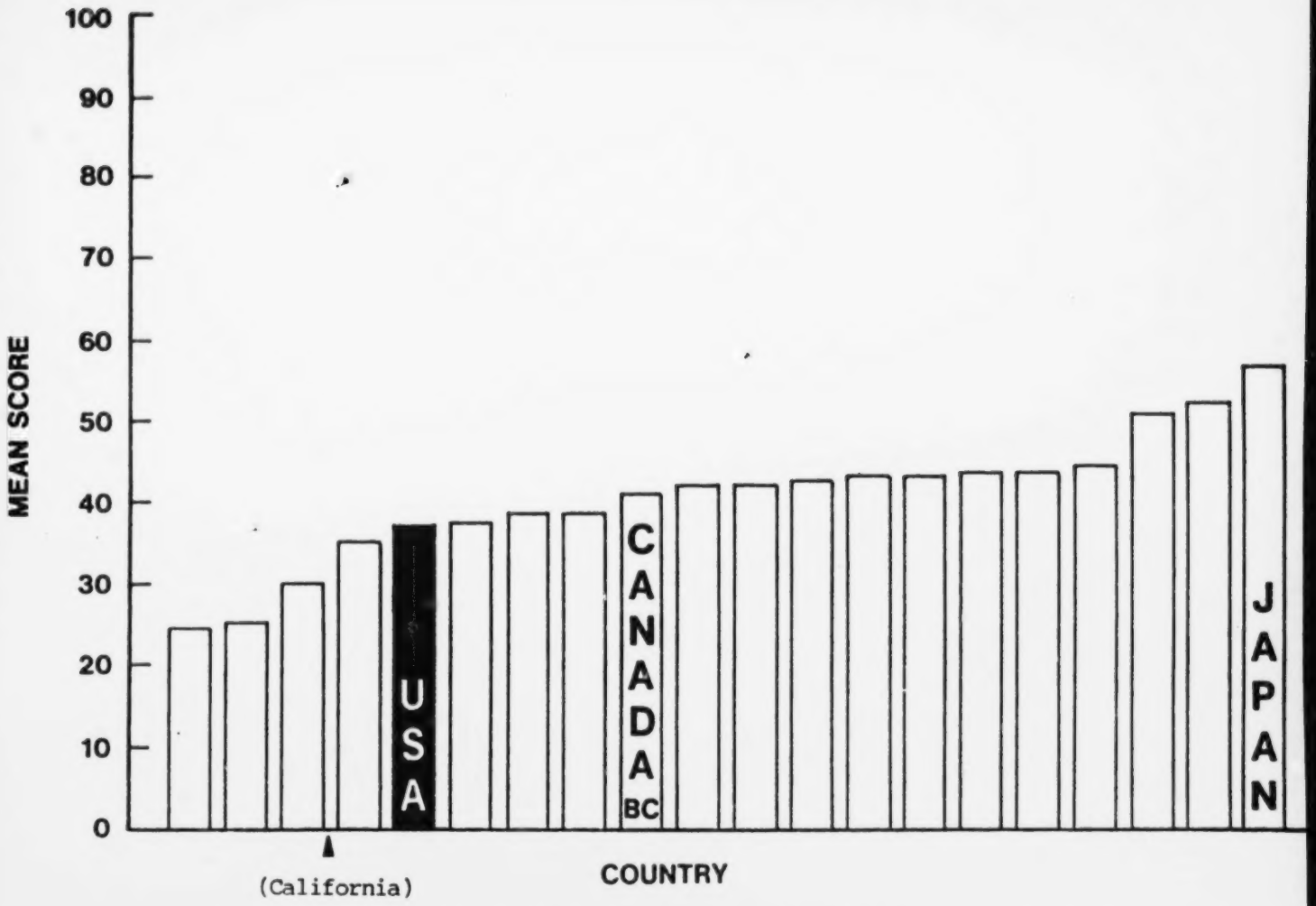


Fig. 8. Mean achievement in goemetry for population A (eighth grade in U.S.) for 20 countries

SOURCE: Second Study of Mathematics--Summary Report, United States. Champaign, IL: University of Illinois at Urbana-Champaign, 1984.

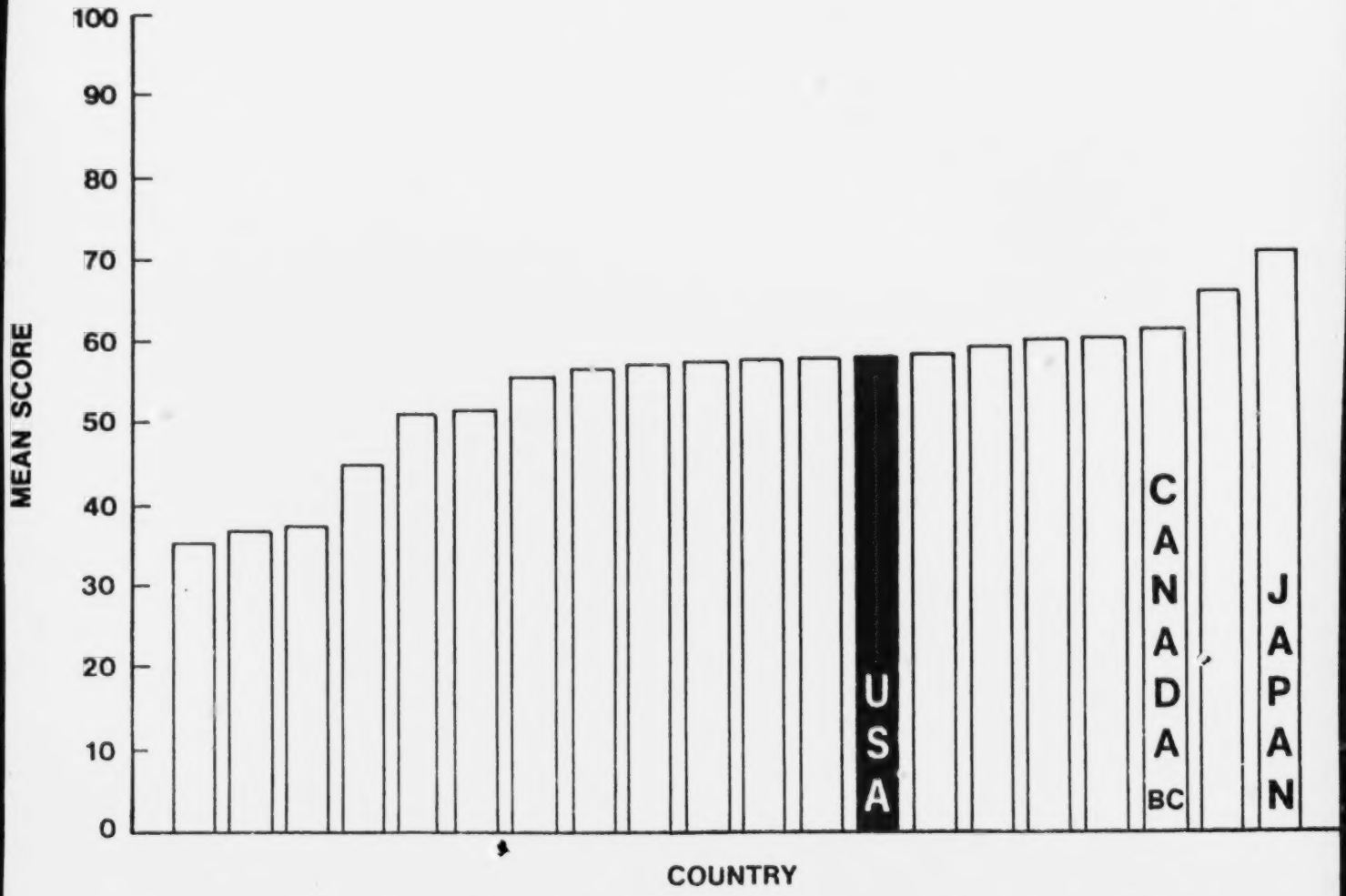


Fig. 9. Mean achievement in statistics for population A (eighth grade in U.S.) for 20 countries

SOURCE: Second Study of Mathematics--Summary Report, United States. Champaign, IL: University of Illinois at Urbana-Champaign, 1984.

Fig. 10. Mean achievement in measurement for population A (Eighth grade in U.S.) for 20 countries

SOURCE: Second Study of Mathematics--Summary Report, United States. Champaign, IL: University of Illinois at Urbana-Champaign, 1984.

Table 30

Comparison of the Achievement of the U.S. Eighth Grade Students with That of International Students on Full IEA Test

Skill	Number of questions	Percent correct score	
		U.S. students	International students
Arithmetic	62	51	50
Algebra	32	43	43
Geometry	42	38	41
Measurement	26	42	51
Statistics	18	57	55

From Table 30 it is evident that the U.S. performs at the international average in arithmetic and algebra and above the international average in probability and statistics; however, the U.S. performs below the international average in geometry and markedly below in measurement.

Table 31 provides the scores of California eighth grade students in comparison to the scores of U.S. students. This comparison is based on 40 core items, not all 180 items used in the IEA study. The breakdown of the scores is derived by classifying the items under skill as well as cognitive categories. The core test did not have any items in probability and statistics; hence, no comparison is available for this skill area.

From Table 31 it is evident that California eighth grade students perform below their national counterparts in all skill areas of mathematics. The discrepancy between the U.S. and California scores is greatest in measurement, followed by geometry, algebra, and arithmetic. California students perform below the national average on computational questions as well as questions involving concepts and applications.

Figures 6 through 10, showing the ranking of the U.S. with other countries, are based on a 180-item test. Since California took only a 40-item test, a statistical adjustment was made to estimate the scores of California students on all 180 questions. In figures 6 through 10, the position of the California students is marked by an arrow. From the graphs it is evident that Japan scores the highest in all skill areas, whereas California students are well below the average on the international ladder.

One of the reasons for introducing a new test at the eighth grade level was to gather information at the junior high level in view of the fact that during the past decade achievement showed a general positive trend in the elementary grades but a steady decline at the high school level. From the

California-international comparison, it is evident that junior high school students are not adequately prepared in their math skills in comparison to their national and international counterparts. There appears to be a general need for improving the skills in all aspects of mathematics, particularly geometry, measurement, and complex word problems.

It is recommended that schools and districts scrutinize their mathematics scope and sequence against "bench mark" skills specified in the Mathematics Framework to upgrade their mathematics curriculum and improve the level of student achievement in grades seven and eight.

Table 31

Comparison of the Achievement of California Eighth Grade Students with That of All U.S. Students on IEA Core Test

Category	Number of questions	California students			U.S. students	Difference: California, U.S.
		Boys	Girls	All		
Skill						
Arithmetic	16	46.9	46.9	46.7	50.0	-3.3
Fractions and decimals	8	46.7	48.0	47.3	48.9	-1.6
Proportions and percents	8	47.1	45.8	46.1	51.1	-5.0
Algebra	8	46.1	45.4	45.8	49.4	-3.6
Geometry	8	41.5	38.1	39.8	44.8	-5.0
Measurement	8	45.7	44.7	45.1	51.1	-6.0
Cognitive						
Computations	20	49.3	49.7	49.4	53.9	-4.5
Concepts/ applications	20	41.6	39.1	40.3	44.2	-3.9

VI. History-Social Science Expansion of the Grade Eight Test

The addition of the new history-social science grade eight test to the California Assessment Program (CAP) was authorized in 1983 under the provisions of SB 813, the Hughes-Hart Educational Reform Act. The grade eight test is to be followed by a complete revision of the twelfth grade test and the development of a test for grade ten, increasing CAP's testing levels to grades three, six, eight, ten, and twelve.

The expansion of CAP underscores the commitment of the Legislature, the Governor, and the Superintendent of Public Instruction to the challenge of educational reform. The increased number of testing levels provides districts with a more complete assessment tool for evaluating the effectiveness of their programs.

Besides expanding the grade levels included in the testing program, CAP is expanding the subject areas tested. As part of the program of educational reform, the areas of science and social science are receiving curricular and assessment emphasis. The beginning of that emphasis is their inclusion in CAP's test for grade eight. The history-social science subject area is scheduled to be added in 1985, and science is scheduled to be added in 1986. This chapter contains background information and progress reports for the content area of history-social science for the grade eight test. Chapter VII contains a description and update for the science portion of the test.

The primary purpose of this section of the Annual Report is to describe the results of the history-social science field tests. Because there has been no previous statewide assessment in this content area at grade eight and, consequently, no baseline data, the results described are the product of the judgment of subject matter specialists who studied item statistics. Although comparisons to a similar assessment at the same grade level are not possible, areas of strength and weakness did appear and will be of interest to history-social science curriculum planners.

In 1975-76 there was a grade seven history-social science assessment of selected California districts. Although this assessment used different reporting categories and occurred at grade seven rather than grade eight, the results will be mentioned when they support or fail to support findings in the recent field tests.

Two statewide surveys were conducted in 1983-84 in which teachers were asked to evaluate and rank possible assessment areas. These results will also be reported.

Assessment Committee Resources and Initial Surveys

In the spring of 1982, the State Board of Education mandated developmental work on statewide assessment in history-social science. In the fall of that year, a statewide committee was established, comprising teachers and curriculum leaders from California schools, districts, offices of county superintendents of schools, and colleges and universities. Committee members are listed in the Appendix. The committee's purposes were to identify history-social science assessment areas and to develop test specifications for the grade eight test.

In addition to the statewide advisory committees, the following resources were used to build the history-social science portion of the grade eight test:

- A survey of other states and English-speaking countries. Other states and English-speaking countries were asked to submit item banks for committee review. Although the committee was impressed with the work of Australia, Canada, and England in the area of geography and in some thinking skill areas, most item banks contained a high proportion of factual/recall items, a category the committee wanted to deemphasize.

- Surveys of history-social science teachers. History-social science teachers in California were asked to rate possible assessment areas in terms of emphasis received in their curricula. The surveys provided the committee with guidelines for determining the major reporting categories for the assessment. The surveys were conducted in 1983 and 1984.

- Wide involvement of teachers in item development. Because the committee could not locate critical thinking items in the banks of other states and countries, many new items had to be produced to provide sufficient items for field testing. While the committee was interested in student performance on items from other states, most of these items were of a factual/recall nature and, although many were included in the spring field test, most did not survive committee review. The emphasis on factual/recall history-social science instruction continues to be a concern locally and nationally. Goodlad's (1984) national survey has found in all content areas ". . . a consistent and repetitive attention to basic facts and skills. Only rarely did instruction go beyond the mere possession of information. One finds little of activities likely to promote an understanding of the manner in which heritages and traditions of the past are operative today and influence the direction and values of society." (John I. Goodlad, A Place Called School, New York: McGraw-Hill, 1984)

- Item writing workshops. To generate enough items on issues and concepts and critical thinking skills items, workshops were held throughout California during 1983-84. The workshops provided the 700 teacher participants with an overview of history-social science assessment. Teachers were then divided into teams to write test questions. Because the workshops were the best source of quality assessment items, this approach will be expanded during test preparation for grades ten and twelve.

- Analysis of current history-social science textbooks. State-adopted textbooks, as well as others reportedly in use by California schools, were analyzed by the committee not only in terms of content area coverage, but in terms of the skills that were addressed. Generally, the committee was very concerned that many of the textbooks neglected the critical thinking skills that the committee felt were important and that were identified in the teacher surveys.

- Consultation with nationally known thinking skill specialists. The committee met on numerous occasions with nationally recognized critical thinking specialists. They are listed in the Appendix with the other advisory committee members.

General Characteristics of the Grade Eight Test

This section provides an overview of characteristics of the history-social science portion of the grade eight CAP test.

The history-social science assessment contains items dealing with a common body of knowledge to which all students at the eighth grade level should have been exposed. Some questions present students with situations that might realistically be encountered at school, at home, in the past, or in the future. All questions involve social studies content and are not "content free." The critical thinking skill items also assume understanding of a common core of knowledge about history-social science and deal with realistic situations and problems.

Assessing California students' learning in relation to standards established by subject area specialists makes it possible to devise items specifically related to California's priorities for history-social science education. It is difficult to set performance standards in the absence of information about student performance at grade eight. The statewide committee decided to build a test related to the documents that contained priorities for history-social science education in California. While test content is based primarily on recommendations contained in the 1981 History-Social Science Framework, the advisory committees also reviewed the State Board's Raising Expectations and the Model Curriculum Standards, Grades Nine Through Twelve.

Major Reporting Categories

The statewide committee identified the following sections for the history-social science assessment:

I. United States History
II. Citizenship/Government
III. World History/Cultures
IV. Geography/Economics
V. Basic Skills
VI. Critical Thinking Skills

Critical thinking skill emphasis. At least 40 percent of the test questions on the history-social science assessment will address the critical thinking skills. These will be described in detail later.

Issues/concepts orientation. The statewide committee limited the use of knowledge items that emphasize rote recall. One of the dangers of any testing program that emphasizes recall is the possibility that it may encourage teaching to less significant aspects of the curriculum. In the grade eight test, for example, questions on the Constitution focus on why it was written and what it represents, rather than on such peripheral details as where it was signed.

Symbolic materials. Over 25 percent of the test items in the history-social science test are supported by graphic materials. Time lines, flowcharts, maps, tables, political cartoons, and other symbolic materials are used widely in the test.

Cumulative skills assessment. As in the other CAP tests in reading, language, and mathematics, the history-social science test reflects a cumulative skills assessment. The field tests assessed knowledge that students should have acquired as far back as grade four. Questions are not limited to the grade eight curriculum.

Contemporary issues. Contemporary issues are included in the history-social science assessment, as recommended in the History-Social Science Framework at the grade eight level. All state-adopted textbooks conclude with sections that address modern concerns.

Large Item Pool

The new history-social science test rests on a sizable item pool of 720 unique test questions. There will be 36 forms of the test, and each form will have a different set of 20 questions representing the major areas of assessment. The chart below describes the content of each form.

	Number of questions			
	Knowledge	Critical thinking	Basic skills	
I. U.S. History	2	2	1	
II. Citizenship/Government	2	2	1	
III. World History/Cultures	2	2	1	
IV. Geography/Economics	2	2	1	
	8	8	4	= 20 total questions per form

Individual student results on each form will be aggregated to provide a school/program score for history-social science. The school-level report will have at least 30 separate reporting categories (or scores). There are four reporting categories for Citizenship/Government, four for U.S. History, three for World History/Cultures, four for Geography/Economics, three in basic skills, and 12 critical thinking categories.

A school that tests 36 students would take the entire test (36 forms x 20 questions = 720 items). The school report would be based on an analysis of 720 test questions. This multiple-form approach (also referred to as matrix sampling) results in considerable statistical power when larger numbers of students are tested. For example, a school that tests 150 students would have a report based on an analysis of 3,000 item responses (150 x 20 questions).

One of the important advantages of the multiple-form approach is that it allows for a broad sampling of the curriculum. Tests that use only a small number of test questions that are the same for all students are much more limited in curriculum coverage. The multiple-form approach has provided the statewide committee with an opportunity to assess a school's history-social science curriculum very broadly and to measure a variety of critical thinking skills.

Results of Statewide Teacher Surveys

Eleven hundred California history-social science teachers participated in scope-and-sequence surveys. In United States History, teachers reported that they were all stressing this reporting category. Over 75 percent of the respondents indicated that they emphasize current events and recent history and that they attempt to tie the past with the present. Many teachers made a very strong plea that CAP address "what should be" and not limit its assessment to "what presently is."

Teachers reported that they are emphasizing all of the areas listed in the Citizenship/Government section of the survey. They supported the values rationale presented in the 1981 History-Social Science Framework:

> It is essential that students at all grade levels have opportunities to encounter both the cohesive, unifying unum values and the pluralistic, individualistic pluribus values to which our democratic constitutional society is committed. It also is important that students have opportunities to learn about the distortions or corruptions to which those values or principles sometimes have been subjected so that as citizens they will have the knowledge, the will, and skills with which to prevent such recurrences.
>
> In addition to explicit concern with the basic civic values and principles, the history-social science education program, kindergarten through grade twelve, should provide students with opportunities to understand value positions taken by individuals, both others and themselves.

Over 50 percent of the teachers mentioned that students were required to pass a test on the Constitution for graduation from eighth grade. Seventy-five percent of the teachers ask students to attempt to write their own constitution. Teachers were anxious that responsibilities be stressed along with rights.

Comments by teachers on the World History/Cultures reporting category revealed that many were not aware of the cumulative nature of CAP testing. Eighth grade teachers thought that seventh grade curriculum would not be covered. Comments from teachers at the CAP workshops held throughout the state have revealed that more sixth, seventh, and eighth grade teachers are now meeting together and with other elementary school teachers to work on K--12 history-social science scope and sequence.

Comments from teachers on the Geography/Economics reporting category reveal that although they believe that geography knowledge and skills are essential, they see it as a "weak" area in their students' achievement. Contrary to teachers' comments on the lack of student knowledge of basic economic terms, students did quite well in this area on the field test. Perhaps more economics is being learned by students than the teachers who responded to the survey realize. About one-half of the teachers believed strongly that economics should be assessed, while the other half believed that eighth grade students would not be able to handle economics in any form.

Not surprisingly, teachers were almost unanimous in their support for the necessity for knowledge of basic skills in history-social science. Although some teachers indicated that the vocabulary for critical thinking was too difficult, those vocabulary items generally did not present a problem for students on the field test.

Teachers were equally adamant that critical thinking was essential to a good history-social science program. "The core," "the foundation," "students can never get enough" are examples of the general tone of the comments teachers made about critical thinking.

Teachers generally were enthusiastic about the importance of a good history-social science curriculum and indicated that assessing it would give history-social science the importance it deserves.

A description of each of the above categories along with field test results follows.

Field Test Results

In the spring and fall of 1984, a total of 29,000 students and 2,000 teachers from more than 30 counties participated in the history-social science field tests. The field tests contained a total of 4,000 items divided among 117 test forms. Each form in the spring field test contained approximately 34 questions, while the fall field test had 20 questions per form. Every district in the state was invited to participate in the field test.

Where appropriate, actual items from the field tests are used to illustrate areas of strength or areas in need of improvement. The illustrative items are shown with "P" values that indicate the percent of students selecting a particular response. The correct answer is indicated in each sample. Although not shown, student performance statistics were aggregated for each item according to sex, education level of parents, and student academic performance.

The 2,000 teachers participating in the field test process were also asked to rate each item in terms of curriculum emphasis. In order to obtain additional information on item difficulty, each student was also asked to indicate whether or not he or she guessed on test questions. Finally, all participating teachers and students were asked to comment qualitatively on every item. Thus, the committee received input directly from teachers and students about vocabulary level, accuracy of item graphics (such as on maps and charts), unclear wording, and other item-related issues.

Overall Results

In terms of overall results of the two field tests, the committee was pleased with student performance in United States History, Citizenship/Government, Economics, Basic Skills, and the Critical Thinking Skills. The committee was concerned, however, that performance on items related to geography and world history was lower than anticipated. This was especially surprising to the committee because teachers who responded to the two statewide teacher surveys indicated relatively high curricular emphasis in both areas, although teachers

did report geography as a "weak" area in terms of student performance. Before the field testing occurred, the committee felt that the areas of economics and critical thinking would be the most difficult for students, but the results did not justify their concerns. It will be interesting for the committee to compare the results of the statewide grade eight assessment that will occur in the spring of 1985 to the field test results in which only a sampling of students participated. It will then be possible to determine whether the overall pattern of results in the field test sample is mirrored in the statewide assessment results.

Illustrative items are intended for eighth grade students and range from very simple, straightforward items to ones that are more difficult. In California, the state testing program is aimed at all students (280,000 eighth graders) and the item bank must contain questions representing a wide range of difficulty. The "P" values (percent of students selecting a particular response) shown are based on results of the spring 1984 field test in which 15,000 California eighth grade students participated. Correct answers are indicated. Teachers are welcome to use these items in their instructional materials. They may also serve as a stimulus for the development of other test questions readers can generate for classroom use.

Following are descriptions of the six major reporting categories and the test results for each:

I. United States History

The report categories in this section include assessment items that examine our nation's ideals, institutions, and values. The influence of geography on history is addressed. Also covered is the sequence of the important events, issues, and episodes that have shaped the development of our country. The significant contributions of individual men and women and of diverse groups to the political, economic, social, and cultural development of our state and nation are included.

School-Level Report Categories

A. Knowledge of the ideals, institutions, and values of the United States

B. Knowledge of the influence of geography on the history of the United States and California

C. Knowledge of the significant issues, events, and episodes that have shaped the development of the United States and California

D. Knowledge of the contributions of individual men and women and of diverse groups to the political, economic, social, and cultural development of the United States and California

The committee was pleased that students generally performed well on items relating to knowledge of our nation's ideals, institutions, and values. Students did well on items dealing with the Pledge of Allegiance, patriotic songs, patriotic slogans, and importance of the family.

Students did not fare well on items relating to the influence of geography on United States history as illustrated by the following items:

Industry in the United States in the early 1800s was centered in the

34 o South.
9 o West.
11 o Mississippi Valley.
44 • Northeast.

Which of the following was an advantage for American manufacturers in the early 1800s?

49 o Use of slave labor
6 o Abundant wildlife
31 • Many swift-running streams to supply water power
13 o An abundant supply of electricity

Students did reasonably well on items relating to colonization and the westward movement. However, the committee was disappointed in student performance on items relating to several significant issues and episodes, such as the Northwest Ordinance, the Missouri Compromise, and the War of 1812.

The committee was pleased that students performed well on items that address the contributions of historic political figures, such as Thomas Jefferson, Susan B. Anthony, and Benjamin Franklin, as illustrated by the following items:

The author of the Declaration of Independence was

64 • Thomas Jefferson.
15 o George Washington.
12 o Abraham Lincoln.
7 o Thomas Paine.

Ben Franklin did all of the following EXCEPT

10 o write Poor Richard's Almanac.
8 o become a member of the Continental Congress.
51 • become President of the United States.
30 o become ambassador to France.

II. Citizenship/Government

Report categories in this section contain assessment items that examine constitutional principles and the protection afforded all members of our society. Items also cover the rights and reponsibilities of our citizens based on the United States Constitution, the Declaration of Independence, and other basic documents as reflected in the structure of government, the political system, the judicial proceedings, and the lives and statements of noteworthy historical figures. Other items address how our principles and institutions have permitted the United States to cope with changes over time.

School-Level Report Categories

A. Knowledge of the similarities and differences among people in our society and of the contributions of significant groups and individuals

B. Knowledge and understanding of basic documents (such as the Declaration of Independence and Constitution), court cases, speeches, slogans, songs, cartoons, and symbols

C. Knowledge of the structures and processes of local, state, and federal government

D. Knowledge of the rights and responsibilities of individuals and the importance of social participation in the affairs of the school, the community, California, and the United States

After review and discussion of the field test results, the committee was pleased to find the following strengths in terms of student performance on Citizenship/Government assessment items. Citizenship/Government was an assessment category in the grade seven sampling test that was administered in 1975-76. Although results of the grade seven test indicated that student performance on items related to citizenship and government was only "adequate," the committee found that grade eight student performance showed considerable improvement.

The committee was pleased to find that students participating in the 1984 field tests demonstrated an understanding of the similarities and differences among people in our society. The results show knowledge of the significant contributions of ethnic and religious groups. The committee was also pleased that the results show student awareness of the contribution of historical figures, such as Abraham Lincoln, John Adams, Patrick Henry, Harriet Tubman, and others. Students also did well on items related to significant documents, such as the Declaration of Independence and the Constitution (including the Bill of Rights).

The committee was concerned, however, that student knowledge of significant contemporary contributions needs improvement. Students did not perform well on items dealing with modern political figures, such as Dianne Feinstein, Geraldine Ferraro, Sandra Day O'Connor, and former President Jimmy Carter.

Student performance in "knowledge of the role of political parties," "process for amending the Constitution," and "particular tasks of the executive branch of the government" was also judged to be in need of improvement. Students in the eighth grade field test, as in the seventh grade sample, demonstrated more knowledge of the federal government than of the California government. Students seemed to show growth in knowledge in items assessing the role of a mayor or of a judge in a court and awareness of the contributions of earlier presidents as well as the identities of the more recent presidents. Students also did reasonably well on items related to the structure and processes of the federal government, except on those items requiring an understanding of the powers of the President.

Students did especially well on items relating to the rights and responsibilities of individuals and the community, California, and the United States, as the following items illustrate:

People who serve on juries are selected

12 o on the basis of age.
72 • from lists of registered voters and vehicle owners.
9 o randomly off the street.
7 o on the basis of whether or not they own property.

A question before the city council concerned raising the local bus fares to help pay increased operating costs. The local community appointed you to a citizen advisory council. As a member of that council, one of your first steps should be to

8 o wait for the city council to act, then criticize the action.
15 o ask all the people whom you know to write down their solutions and turn them over to the city council.
71 • get as much information as you can from all sides and then submit your ideas.
5 o resign because you think the issue could not be solved.

Citizens of the United States may legally express their opinions by doing all of the following EXCEPT

8 o writing letters to members of the U.S. Congress.
8 o electing new people to the Congress who agree with their opinions.
79 • refusing to pay taxes that pay for things they don't agree with.
10 o signing a petition that supports their viewpoint.

III. World History/Cultures

The World History/Cultures section encompasses the major epochs, eras, events, and turning points that have shaped human societies. It includes the historical and cultural contributions of individuals and groups. It also addresses the relationship of the past to the present, the reality of global interdependence, and the nature and rate and implications of change.

School-Level Report Categories

A. Knowledge of the major epochs, episodes, events, and turning points that have shaped the history of world civilizations

B. Knowledge of the contributions of individuals to world history/cultures

C. Knowledge of continuity, change, and interdependence in the development of world cultures and institutions, and of the importance of language and beliefs in all societies

Performance on World History/Cultures items was judged to be poor by the committee and was one of the two areas of greatest concern (the other was geography, which will be discussed later).

The committee felt that students did not perform well on items requiring knowledge of the contributions of great civilizations, such as the Roman, Greek, Chinese, Judaic, and Islamic societies. Equally disappointing was student

performance on items dealing with the Middle Ages, feudalism, and early nation states. Strengths in student knowledge were demonstrated on items related to World War II, the holocaust, and the knowledge of certain inventions and discoveries. Performance on the following items about Renaissance and feudalism illustrates why the committee was concerned about World History/ Cultures field test results:

During the Middle Ages, a system of government was started which included kings, nobles, lords, dukes, and knights. What was this new system called?

17 o democracy
49 • feudalism
12 o republic
21 o communism

The movement that marked a renewal of European interest in Greek and Roman art, literature, and learning was the

33 o reformation
14 o counter-reformation
39 • Renaissance
14 o mercantilism

Performance on items related to significant individuals in World History/ Cultures was equally disappointing, except on items involving twentieth century figures, such as Gandhi and Hitler.

IV. Geography/Economics

Assessment items in geography are concerned with the study of the dynamics of the earth's atmosphere, weather and climate, erosional and landform-building processes, flora and fauna and the natural environment. (This section does not address basic skills related to geography. See Section V, Basic Skills, for assessment areas related to maps and other basic skills.) In economics, items are concerned with the study of how people use their limited resources to satisfy needs and wants over time.

School-Level Report Categories

A. Knowledge of physical geography: the earth's landforms, oceans, atmosphere, weather and climate, and the natural environment

B. Knowledge of human geography: the activities, similarities, and differences of people and their interactions with the environment

C. Knowledge of geographic systems: the dynamic interaction between geographic factors within a physical and/or cultural setting that produces a condition different than that produced by any factor operating alone

D. Knowledge of economic concepts: how people use their limited resources to satisfy their needs and wants over time

Geography. As has been mentioned, geography was also an area of special concern to the committee. While in the basic skills of geography (such as map reading) the committee felt students performed reasonably well, student understanding of principles and components in physical geography was less than satisfactory. Items in this area are concerned with such topics as the planetary arrangement of land and water, climatic cycles, tectonic processes, and magnetic actions.

The committee judged student performance in human geography to be poor. This area includes such topics as cultural, political, and urban geography and demography. Students did the best on items related to environmental pollution. The committee also felt that performance on items related to geographic systems did not meet expectations.

Which of the following statements is TRUE about Chinese geography?

25 o The mountains of China are along the east coast.
17 o The rivers of China are navigable for only a short distance.
31 • Geography has in part isolated China from the world.
26 o Geography has had little to do with China's unique development.

The mountainous topography of Japan:

12 o prevents the large population from becoming too dense in any one area.
35 • leaves little land for the raising of crops.
17 o causes the Japanese to live mainly on the plateaus of Shikoku.
35 o gives Japan protection from the monsoon winds.

Economics. The committee was pleasantly surprised at student performance on items related to economic concepts, such as economic resources (land, labor, capital), scarcity, the relationship between unlimited wants and limited resources, economic systems, and specialization of labor. Students did less well on items related to the concept of opportunity costs, command systems, and global economic interdependence.

An economy in which the economic decisions are directed by a central authority (such as the government) is called a

19 o market economy
21 o mixed economy
18 o developing economy
41 • command economy

When a government places a tax on the importing of goods, it is creating

7 o a quota
59 • a tariff
20 o an embargo
12 o a monopoly

V. Basic Skills

Basic skills in the social studies are the skills that students must have in order to acquire knowledge from the social sciences and from history as presented in all media. Assessment items include such skills as interpreting maps, charts, graphs, time lines, and other symbolic materials; locating, selecting, and organizing information using appropriate reference materials; and understanding vocabulary appropriate to history-social science.

School-Level Report Categories

A. Read and interpret maps and globes, models and diagrams, graphs, time lines, charts, tables, pictures, and political cartoons

B. Locate, select, and organize information in textbooks, encyclopedias, specialized dictionaries, almanacs, and other reference materials

C. Understand vocabulary related to history-social science, including critical thinking process terms

Generally, the committee was very pleased with student performance on basic skill items related to reading and interpreting maps of California, the United States, and the world. Students did equally well on items involving models, diagrams, and graphs. Students were able to read and interpret time lines, but experienced difficulty with items requiring knowledge of the sequence of historical events when a graphic time line did not accompany the items. Students also did well on items related to card catalogs, tables of contents, indices, and atlases, except for items related to biographical materials. (The skill of outlining is assessed in CAP's reading test, and performance was judged as "satisfactory" by the reading assessment advisory committee.)

Which of the following events occurred FIRST?

33 o George Washington was elected President.
35 • British troops and the colonial militia exchanged shots at Concord.
16 o The Declaration of Independence was signed.
16 o The British surrendered at Yorktown.

Where would be the best place to find information on the air distances between New York City, London, and Moscow?

67 • an atlas
17 o an almanac
6 o a biographical dictionary
8 o the Readers' Guide

The committee was especially pleased with student performance on history-social science vocabulary and on terms related to critical thinking. Students demonstrated understanding of such terms as authority, democracy, justice, integrity, code of ethics, republic, and checks and balances. In the critical thinking vocabulary assessment, students did well on such terms as hypothesis, inference, relevance, generalization, prejudice, criteria, and analysis.

VI. Critical Thinking Skills

Generally, the critical thinking skills examined by assessment items in this section are considered to be skills involved in reasonably deciding what to believe and do. These skills are developed through everyday living as well as by schooling, but the classroom is an ideal place to discuss and practice critical thinking. Assessment items consist of questions about subjects covered in the preceding Sections I, II, III, and IV of this Assessment Outline. These questions involve analyzing, making judgments, and drawing conclusions.

Scores for the 12 skills underlined in the "CTS Process Model" on the next page will be reported to schools. The model is further described here.

Approaches to critical thinking skills (CTS) assessment. Different approaches are used to assess the critical thinking skills: objective questions, CTS vocabulary, and student writing. The major part of the CTS assessment consists of objective questions. The vocabulary portion of the assessment includes terms associated with critical thinking. In the future, a student writing requirement will become an integral part of the CTS assessment.

The CTS advisory committee and the statewide committee identified three groups or clusters of critical thinking skills: defining and clarifying the problem, judging information related to the problem, and solving problems/drawing conclusions. In defining problems at the eighth grade level, the committee felt that students should be able to identify central issues, compare similarities and differences, determine relevance of information, formulate appropriate questions, and express problems clearly and concisely. In judging information, students should be able to distinguish among fact, opinion, and reasoned judgment; check consistency and identify unstated assumptions; recognize and minimally reason within value orientations and ideologies; recognize bias, emotionalism, propaganda, and semantic slanting; and recognize stereotypes and cliches. In solving problems and drawing conclusions at the eighth grade level, students should be able to recognize the adequacy of data, identify reasonable alternatives or solutions, predict possible consequences, and test conclusions or hypotheses.

The committee members, basing their judgment on the state curriculum framework, teacher survey results, and prolonged consultation with CTS advisers (listed in the Appendix), identified 15 skills that they perceived to be essential for critical thinking. The 15 skills are presented as part of a larger process involved in solving problems or in reaching conclusions or decisions. This process is summarized in the "CTS Process Model."

The process model begins with unassessed information that students and adults must deal with all their lives. Basic skills in social studies provide students with the skills necessary to deal with written statements and symbolic materials. The second section of the model contains the basic skills that provide students with abilities to locate and organize information in textbooks and other reference materials, understand cause and effect relationships, and learn social studies vocabulary.

CTS PROCESS MODEL

UNASSESSED INFORMATION

from
school, home, community, books
magazines, TV, newspapers, maps, and so forth

Basic Skills

Interpret maps, charts, graphs, time lines, and other symbolic materials; locate and select information using appropriate reference materials; organize information into categories; and understand history-social science vocabulary.

Critical Thinking Skills*

A. DEFINING AND CLARIFYING THE PROBLEM

1. Identify central issues or problems.
2. Compare similarities and differences.
3. Determine which information is relevant.
4. Formulate appropriate questions.
5. Express problems clearly and concisely.

B. JUDGING INFORMATION RELATED TO THE PROBLEM

1. Distinguish among fact, opinion, and reasoned judgment.
2. Check consistency.
3. Identify unstated assumptions.
4. Recognize stereotypes and cliches.
5. Recognize bias, emotional factors, propaganda, and semantic slanting.
6. Recognize different value orientations and different ideologies.

C. SOLVING PROBLEMS/DRAWING CONCLUSIONS

1. Recognize the adequacy of data.
2. Predict probable consequences.
3. Identify reasonable alternatives.
4. Test conclusions or hypotheses.

Process Outcomes

The desired outcomes of the above process are students who can:
- o Assess information around them, define problems, weigh evidence, and draw conclusions.
- o Participate effectively as citizens in a representative democracy.
- o Defend and justify intellectual and personal values, present and critique arguments, and appreciate the viewpoints of others.

*Underlined skills are assessed in the objective portion of the statewide test.

The 12 underlined skills that are assessed in the objective portion of the eighth grade statewide test are pathways or objectives that students and adults need to master in order to reach the CTS goal already described. The skills that are not underlined will not be assessed in the objective portion of the statewide test, but the writing requirement may address some of these skills.

While the skills are presented serially, this is not intended to suggest that students should think this way. In reality, students use these skills in different combinations in order to solve problems. But for clarification and discussion, they are presented separately, one by one along with illustrative items.

Development of CTS test items. The committee conducted a test item survey of other American states, all English-speaking countries, and commercial test publishers. True to expectations, other tests contained primarily factual/recall items. Many of the critical thinking skill items that do exist (with some exceptions) appeared similar to reading skill items in which the student is presented with a lengthy passage and then asked questions about its content. After the survey, CAP's history-social science bank contained more than 6,000 items, but only 1 percent of these were judged to be critical thinking skill items.

To shore up CAP's CTS item bank, several experienced item writers were hired. However, most of the CTS items came from workshops held in major counties in California in the spring of 1983 (San Diego, Los Angeles, Ventura, San Bernardino, Kern, Sacramento, Alameda, Santa Clara, Shasta, and Contra Costa). Items produced by California teachers at the workshops were used to illustrate the critical thinking skills.

The committee was very pleased with student performance on the critical thinking skill items except for two of the skills under "Judging Information": (1) recognizing stereotypes and cliches; and (2) recognizing bias, emotional factors, propaganda, and semantic slanting. Under "Solving Problems/Drawing Conclusions," the students experienced difficulty in recognizing the adequacy of data. The 12 skills that were assessed are defined and illustrated on the following pages with field test questions. The number at the left of each distractor is the percent of students who selected that response.

A more detailed discussion of the critical thinking skills addressed in the new history-social science test may be found in a report entitled Assessment of the Critical Thinking Skills in History-Social Science. The report is available from the California Assessment Program office.

A. DEFINING AND CLARIFYING THE PROBLEM

1. Identify central issues or problems.

The ability to identify the main idea or point of a passage, an argument, or a political cartoon, for example. At the higher levels, students are expected to identify central issues in complex political arguments. The students should be able to identify major components of an argument, such as reasons and conclusions.

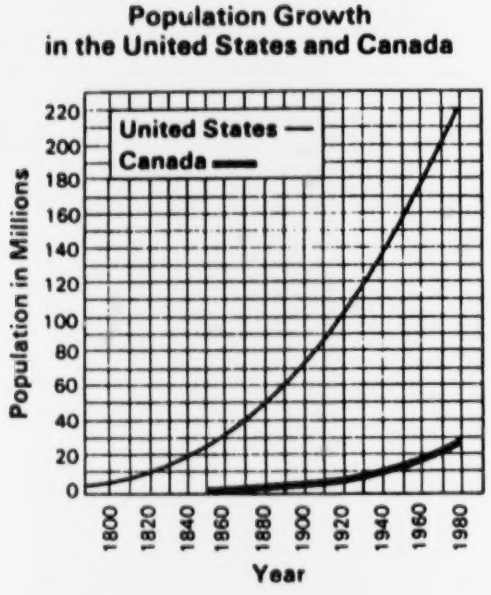
C. Rover, 1870

Which of the following best describes the cartoonist's view of the attitude of British lawmakers to the demands for women's rights?

70 • stubbornly resistant
3 o prepared to negotiate
4 o thoughtful and understanding
22 o unaware of the determination of the women campaigners

2. Compare similarities and differences.

The ability to compare similarities and differences among two or more objects, living things, ideas, events, or situations at the same or different points in time. Students should be able to identify distinctive attributes and to organize information into categories for different purposes.

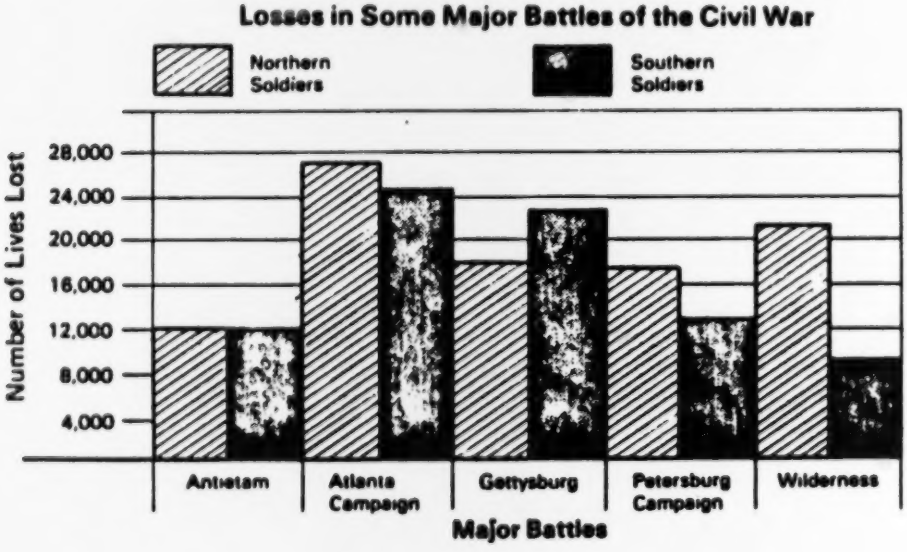


Which of the following statements is true concerning the population growth of the United States and Canada?

5 o Both the United States and Canada are growing at the same rate.
82 • The United States is growing in population more rapidly than Canada.
4 o People do not like living in Canada.
6 o There are more people living in Canada than in the United States.

3. Determine which information is relevant.

The ability to make distinctions between verifiable and unverifiable, relevant and nonrelevant, and essential and incidental information.



Which one of the following statements can be verified by the information in this graph?

8 o The North and South suffered equal numbers of wounded in the battles included on the graph.
10 o The South lost more enlisted men, while more Northern officers were killed.
11 o The battle at Antietam was the hardest fought battle.
67 • The largest number of deaths took place during the Atlanta campaign.

4. Formulate appropriate questions.

The ability to formulate questions that will lead to a deeper and clearer understanding of an issue or situation and of different points of view from which an issue or situation can be approached.

Central Europe in 1935

Central Europe in 1949

Which of the following questions might lead to a better understanding of the relationship between these two maps?

5 o Who is the present political leader of Poland?
11 o What are the main differences between the governments of Hungary and Rumania?
11 o Is Czechoslovakia a major world power?
70 • What happened in central Europe between 1935 and 1949?

5. Express problems clearly and concisely.

Without the ability to express issues in writing as well as orally, students will have only limited participation in private and public affairs. They should be able to express their views in a letter to an elected representative or to the local newspaper, as well as to communicate effectively in small or large groups. Their ideas and innovations may remain untapped and formless unless they receive classroom training in self-expression. It is difficult to assess this skill on an objective test; therefore, the committee recommended that it be addressed through the student essay component.

B. JUDGING INFORMATION RELATED TO THE PROBLEM

1. Distinguish among fact, opinion, and reasoned judgment.

The ability to apply criteria for judging the quality of observation and inference.

Which one of the following statements about the United States Congress is a FACT rather than an opinion?

3 o Congress works too slowly.
4 o Congress is overpaid.
13 o Congress wastes money.
78 • Congress makes our laws.

2. Check consistency.

The ability to determine whether given statements or symbols are consistent with each other and their context. For example, the ability to determine whether the different points or issues in a political argument are logically connected and agree with the central issue.

"America is the land of opportunity. Anyone in the world should be able to come here and have the chance to develop his or her talents. The problem is that everyone would want to come here. So, to protect those who are here already, we must be practical and limit immigration."

Is this speaker being consistent?

10 o No, because he says that America is the land of opportunity but that we must be practical.
18 o Yes, because, after all, we must be practical.
13 o Yes, because communists are the only ones not allowed to come here.
56 • No, because he says he wants anyone to be able to come here, but he also says that we must stop some people from coming here.

3. Identify unstated assumptions.

The ability to identify what is taken for granted, though not explicitly stated, in an argument.

Southern slave owners were often puzzled by the fact that the slaves who were taught a trade or were taught to read and write were the ones most likely to try to escape slavery.

Which of the following can you assume about the dissatisfaction of educated slaves?

4 o Most educated slaves liked plantation life.
9 o Slaves were ungrateful for good treatment.
9 o Slaves should not have been taught to read and write.
76 • Educated slaves had a better understanding of the meaning of freedom.

4. Recognize stereotypes and cliches.

The ability to identify fixed or conventional notions about a person, group, or idea.

Bonnie and Peter were trying to decide who should be on the Academic Decathlon team with them. Bonnie suggested that Frank join them. Peter responded by saying, "No, not Frank. He plays football, and athletes don't do well in the classroom."

Peter's response expresses

46 • stereotyping
6 o propaganda
31 o rational thinking
13 o a theory

5. Recognize bias, emotional factors, propaganda, and semantic slanting.

The ability to identify partialities and prejudices in written and graphic materials. Students should be able to determine the credibility of sources (gauge reliability, expertise, and objectivity).

"The Americans who died at the Battle of Lexington are the village heroes who were more than of noble blood, proving by their spirit that they were a race divine. They gave their lives in testimony to the rights of mankind."

Which of the following persons would you expect to have said the above?

16 o an American sympathetic to the British
49 • an American sympathetic to the colonists
23 o a British member of Parliament
10 o a French person who did not favor one side over the other

6. Recognize different value orientations and different ideologies.

The ability to recognize the similarities and differences among different value orientations and ideologies.

John: "I think it's important that government maintain order. All these protests are disturbing the peace. People tend to be too critical of the government and it is very disruptive. How can elected officials ever do their work if people are criticizing them all the time?"

Bill: "I think it's important that people let their opinions be known. Protests are okay as long as they aren't violent."

The value conflict at issue here is

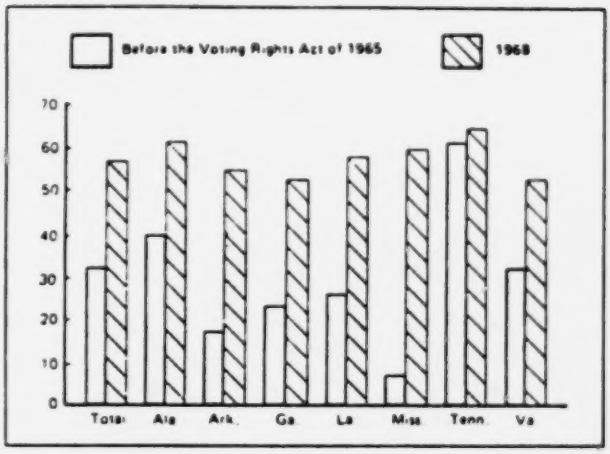
47 • maintenance of order versus freedom of speech.
19 o union protests versus student protests.
30 o a representative government versus a true democracy.
2 o dictatorship versus authoritarian rule.

C. SOLVING PROBLEMS/DRAWING CONCLUSIONS

1. Recognize the adequacy of data.

The ability to decide whether the information provided is sufficient in quality and quantity to justify a conclusion, decision, generalization, or plausible hypothesis.

Percent of Registered Black Americans



Based upon the graph above, which of the following conclusions can you make about black American voters?

43 • After the 1965 law, the number of black Americans registered to vote increased in every state listed.
13 o Prior to the 1965 law, many black Americans had no interest in voting.
19 o Only those states listed denied black Americans the right to vote.
26 o The greatest increase in the black American voting population occurred in Tennessee.

2. Predict probable consequences.

The ability to predict probable consequences of an event or series of events.

If the United States had only one political party, which one of the following problems might arise and pose a threat to our country?

54 • Elected officials would not be obliged to carry out the people's wishes.
18 o Party conventions would no longer be necessary.
14 o We would no longer have a military.
11 o Having only one party is ideal.

3. Identify reasonable alternatives.

Students need to learn that there is often more than one solution to a problem. Social issues especially are frequently immersed in values and subjective information where a "right" answer is almost impossible. The "best answer" often depends on the context of the issue and the time and region of the country or world where it occurs. Students need practice at proposing and evaluating alternative solutions. They must be aware that complex problems often have more than one viable solution. (This skill is not addressed in the objective portion of the statewide assessment.)

4. Test conclusions or hypotheses.

Students need to understand the provisional nature of conclusions, especially those drawn in a social studies context. Again, time, location, geography, and hundreds of other contextual considerations can affect the outcome of a given problem. While predicting outcomes can lead to better solutions, the actual testing of conclusions or hypotheses is a far more sophisticated aspect of the rational decision-making process. The committee decided that this skill was too advanced for eighth grade students, although some field-tested items asked students to "identify" a reasonable hypothesis or explanation.

NOTE: In addition to deciding on the general skills to be assessed, the statewide social studies committee specifically recommended that student writing be required as part of the assessment and be considered an integral part of the assessment of critical thinking skills.

Reading Test Performance

History-social science vocabulary items also appear on the grade eight reading test, as well as science and literature vocabulary items. Of the three areas, students performed most poorly on science items and the best on vocabulary items associated with literature. In terms of performance on the comprehension of passages in the reading test, the highest scores were received on history-social science passages. Student performance on science passage comprehension was the lowest of the three content areas, and comprehension of literature passages was just below that of history-social science.

In the written expression test for grade eight, one of the skills assessed is entitled "Critical Judgments" and requires students to examine student essays related to content areas and then to respond to evaluative questions. Students performed considerably better on history-social science essays in this regard than they did on essays related to literature and science.

VII. Science Expansion of the Grade Eight Test

The introduction in 1983-84 of a grade eight CAP test is described elsewhere in this report. Chapter VI begins with a brief background of the content area expansions of the grade eight test. This chapter contains a description of the work done through the fall of 1984 on the science portion of the test.

Science is scheduled to be added to the eighth grade test in 1986, a year after the implementation of the history-social science portion. Because development of the science portion began a year after work started on the history-social science portion, science findings are not as conclusive as those in the other area. So far, one field test of the item pool has been conducted.

The purpose of such a field test is not to gauge achievement but to "test the test." That is, the data are used to judge the accuracy, validity, and reliability of the test items. Many items are eliminated on the basis of those results. Therefore, "scores" on a preliminary field test such as this cannot be taken as measures of students' achievement.

The schedule for developing the eighth grade science test is as follows:

- Spring 1984--field test content items
- Spring 1985--field test process items
- Spring 1986--science test items included on CAP grade eight test

Test Development

In January of 1983 the Science Assessment Advisory Committee was formed. Twenty leading science educators from around the state were selected to be members of the committee. They represent various disciplines, levels, and geographic areas. The committee developed an outline of test objectives based on the draft of the 1984 Science Framework Addendum. During the next several months, items were collected from 14 item banks and other sources. Committee members then reviewed over 5,000 items. Workshops involving 70 eighth grade teachers were also held to review items and write 600 new items.

Following the Addendum, the committee divided the science portion of the test into two general categories. The science content category covers scientific concepts and facts. Science process covers procedures that are essential to the scientific method. Through the fall of 1984, the focus of test development has been on the science content items. The content portion will account for approximately 60 percent of the test. The science process skills will account for approximately 40 percent. There will also be some items on technology, individuals, and society as well as manipulative skills and safety.

The following outline, based on the Addendum, is the one used in developing the science portion of the grade eight test:

I. Content

A. Biological science

1. Cells, genetics, evolution
2. Plants

3. Protists
4. Animals
5. Human beings
6. Ecosystems

B. Earth science

1. Astronomy
2. Geology and natural resources
3. Meteorology
4. Oceanography

C. Physical science

1. Matter
2. Mechanics
3. Energy

a. Sources and transformations
b. Heat
c. Light
d. Electricity and magnetism
e. Sound

II. Process

A. Scientific thinking processes

1. Observing
2. Comparing
3. Organizing
4. Relating

a. Space-time relationship
b. Hypothetical
c. Experimental

5. Inferring

a. Interpretive
b. Predictive

6. Applying

B. Science, technology, individuals, and society

1. Knowledge of the major processes and products of science
2. Knowledge of interrelationships between science, technology, and society
3. Major turning points and contributions to the development of science and technology
4. Knowledge of careers related to science and technology

C. Manipulative skills and safety

1. Laboratory safety
2. Use of laboratory apparatus
3. Care of living organisms

Field Test

As a result of the item review, 1,250 items were selected for field testing. In the spring of 1984, field test forms were mailed out to 30 districts that had volunteered to participate. In districts that participated, 3,734 eighth grade students took the test.

The results of the field test indicate that the eighth grade students performed better on biological science than on earth and physical science (Table 32). The students' performance on earth science was relatively weak. In the area of biological science, human biology was a relative strength; protists, monera, and fungi were areas of relative weakness. In earth science, earthquakes, volcanoes, and plate tectonics were relative strengths; the area of oceanography was a relative weakness. In physical science, heat energy was a relative strength; the area of nuclear reactions was a relative weakness.

Table 32

Areas of Relative Strength and Weakness
Indicated by Grade Eight Science Field Test Results

Science branch	Relative strengths	Relative weaknesses
Biological	Human biology	Protists, monera, and fungi
Earth	Earthquakes, volcanoes, and plate tectonics	Physical and chemical aspects of oceanography
Physical	Heat energy	Nuclear reactions

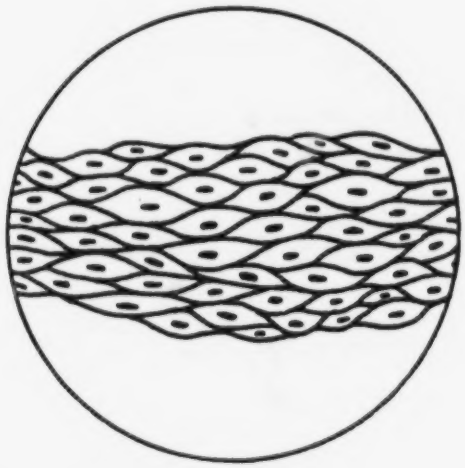
Percent correct scores for the field test are not reported here; those scores are useful only in comparing scores across years when the test remains unchanged. Many changes will be made to the test before the final version of the test is available for use. Therefore, any comparison of field test scores with other test scores would be misleading.

Sample Items

The following samples are included here to illustrate some of the types of questions used.

Biological science--cells, genetics, and evolution

A group of cells looks like this under a microscope.



These cells all work together to do the same thing. A group of cells like this is called

- • a tissue.
- o an organism.
- o an organ.
- o a system.

Earth science--Astronomy

The sun is the only body in our solar system that gives off large amounts of light and heat. Why can we see the moon?

- • It is reflecting light from the sun.
- o It is without an atmosphere.
- o It is a star.
- o It is the biggest object in the solar system.

Physical science--Matter

The air was pumped out of a can, and the can collapsed. Which of the following best explains why this happened?

- o Air molecules inside the can collapsed.
- o Pumping out the air molecules weakened the can.
- • The air pressure inside the can became less than the pressure outside the can.
- o Pumping the air out of the can increased the number of air molecules around the can.

Scientific thinking processes--Relating: Hypothetical

A doctor kept records on the breathing rates of people resting. This chart was made from the records:

Breathing Rates

Persons	Breaths in one minute
Baby boys	38
Seven-year-old girls	25
Seven-year-old boys	25
Ten-year-old boys	20
Mothers	10

The chart suggests that

- • Younger people breathe faster than older people.
- o Girls breathe faster than boys.
- o Older people breathe faster than younger people.
- o Age makes little or no difference in breathing rate.

Processes--Relating: Experimental

In order to determine the cause of disease X, one thousand people with the disease were examined. All had Bacteria Q in their mouths. The conclusion reached was that Bacteria Q is the cause of the disease. Which of the following is true?

- o The conclusion is false because the data do not support it.
- o The conclusion does not deal with the problem.
- o The conclusion is a good one because the data support it.
- • No conclusion should be made until people without the disease are examined.

Processes--Science, technology, individuals, and society

Three of these statements are facts. One statement is a hypothesis. Which statement is the hypothesis?

- o The boiling point of water is 100°C.
- o A gallon of water weighs about eight pounds.
- o The Empire State Building is more than 50 stories high.
- • The rings of Saturn were formed from a moon that exploded.

Processes--Manipulative skills and safety

If you accidentally splash chemicals into your eyes during a lab procedure, you should

- o Rinse your eyes with water only if you know the chemicals are hazardous.
- o Rinse your eyes with water only if the chemicals were acids.
- • Rinse your eyes with water immediately.
- o Request to see the school nurse at her earliest convenience.

Teacher and Student Reviews

Eighth grade teachers were asked to review the field test items on a voluntary basis; 1,128 teachers participated in the review process. For each item the teachers were asked to respond to (1) the amount of curriculum emphasis (much, some, none); (2) whether it should be included on the test or not; and (3) any problems with the item (no correct answer, two or more answers, misleading art, other). The teachers were also asked whether most of the questions on the test were at the appropriate reading level, excluding content-specific vocabulary. Both teachers and students were asked to comment on any questions.

These results, along with the item analysis results, are being used to evaluate each item. Decisions will be made regarding revisions and deletions of items and the need for new items based on all these data.

The results of the teacher review indicated that greater emphasis is placed on biological science in the classroom than earth or physical science. This finding agrees with the results of the field test, which showed higher scores in biological science (see figures 11 and 12). Earth science was emphasized the least in science curriculum and also showed the lowest achievement of students on the field test.

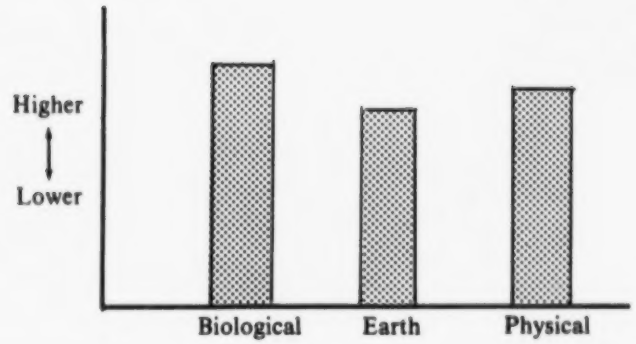


Fig. 11. Comparison of curricular emphasis given to the branches of science in the eighth grade

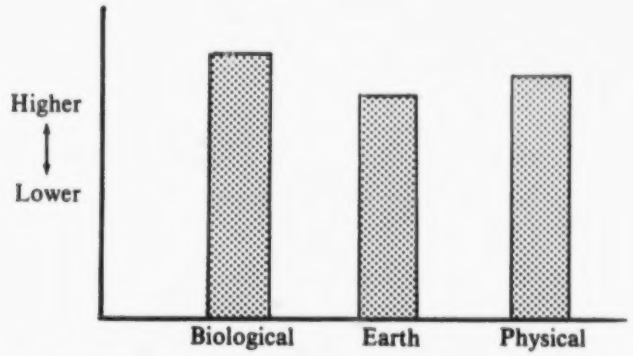


Fig. 12. Comparison of eighth grade students' performance on the science field test, by branch of science

In the area of biological science, the greatest emphasis is on cells and tissues, organs and body structures, human biology, and plants. The least emphasis is placed on evolution, genetics, and behavior. In the area of earth science, the greatest emphasis is on astronomy and the least on oceanography. In the area of physical science, the greatest emphasis is on matter, particularly structure of matter, phases, and physical changes. The least emphasis is placed on energy, particularly light and electricity, magnetism, force, motion, and mechanics.

Science Instruction and Homework

The results of questions asked of seventh and eighth grade school administrators regarding instructional time in science are shown in Table 33. The responses are similar for both grades. Thirty-four percent of the schools reported offering science as part of a core program. For the number of semesters required, 59 percent of seventh grade schools and 66 percent of eighth grade schools reported two semesters. For the days per week required, 84 percent of seventh grade schools and 85 percent of eighth grade schools reported five days per week. For the minutes per week, 30 percent of the seventh grade schools reported 201-225 minutes per week; 29 percent of the seventh grade schools and 28 percent of eighth grade schools reported 226-250 minutes per week of science instruction.

Table 33

Science Instructional Time in Seventh and Eighth Grades, 1983-84

Instructional time	Percent of schools	
	Grade 7	Grade 8
Part of core program	34	34
Number of semesters		
0	7	4
Less than 1	3	2
1	31	28
2	59	66
Days per week		
0	4	3
1	1	1
2	3	3
3	5	5
4	3	3
5	84	85
Minutes per week		
0	4	3
Less than 125	5	5
126-150	5	5
151-175	4	4
176-200	6	6
201-225	30	28
226-250	29	28
251-275	13	17
More than 275	5	5

SOURCE: School information form, administered with the Survey of Academic Skills: Grade 8, 1983-84.

The results of questions asked of twelfth grade students regarding courses completed, homework, and tests and quizzes in science are shown in Table 34. These data are also reported in the Survey of Basic Skills: Grade 12, 1984 school report (See "Subgroup Report" section, p. 5). The results are reported in the grade twelve school report at the state, district, and school levels.

For the number of science courses completed, the largest percentage of students (35 percent) indicated two years. Twenty-nine percent reported one year and 21 percent reported three years of science.

Two questions were asked about homework:

1. How much time did you spend on homework yesterday in science?
2. How many days per week do you have homework in science?

Table 34

Science Course and Homework Information
on Twelfth Grade Students, 1983-84

Type of information	Percent of students							
		By sex		By parents' educational level				
	Total	Boy	Girl	Not H. S. grad.	H. S. grad.	Some coll.	Coll. grad.	Adv. deg.
Courses completed								
None	1	1	1	2	1	1	1	1
One year	29	27	31	40	36	30	24	18
Two years	35	34	36	33	36	37	36	34
Three years	21	22	20	15	17	21	24	28
Four years	9	10	8	6	6	8	11	14
Five years or more	2	2	1	1	1	1	2	3
No response	4	3	3	4	3	2	2	2
Time on homework								
No assignment	14	16	13	14	15	15	15	15
Didn't do it	3	4	2	3	3	3	4	5
Less than one hour	14	16	12	11	11	14	16	18
Between one and two hours	10	10	11	9	8	10	12	15
More than two hours	3	3	4	3	2	3	4	5
Not taking this course	49	45	54	55	57	52	46	39
No response	6	6	4	6	5	4	4	4
Days of homework								
Every day	12	12	12	9	8	11	14	19
Four days	7	8	6	5	5	7	8	10
Three days	10	11	9	8	8	10	11	13
Two days	6	7	6	5	6	6	7	7
One day	4	4	3	4	3	4	4	4
None	3	4	3	4	4	3	3	2
Not taking this course	53	50	58	60	62	56	50	42
No response	5	5	3	4	3	3	3	3
Tests and quizzes								
Daily	1	2	1	1	1	1	1	2
Twice a week	4	4	3	4	3	3	4	5
Weekly	11	13	10	11	10	11	13	14
Every other week	17	19	16	12	13	17	21	25
Once a month	5	6	5	4	4	5	6	7
Less than once a month	2	2	2	2	2	2	2	2
Not taking this course	54	51	59	62	64	58	51	43
No response	5	5	3	4	3	3	3	3

SOURCE: Student information section of the Survey of Basic Skills: Grade 12, administered 1983-84.

For the time spent on homework, 49 percent of the students reported not presently taking a science course. Fourteen percent reported no assignment, 14 percent less than one hour, and 10 percent between one and two hours of homework. For the days of homework, 53 percent of the students reported not presently taking a science course. Twelve percent reported having homework every day, and 10 percent indicated three days a week.

The following question was asked about tests and quizzes: How often do you have tests and quizzes in science? Fifty-four percent indicated that they were not presently taking a science course. Seventeen percent reported every other week, and 11 percent of the twelfth graders reported weekly tests and quizzes in science.

VIII. Comparisons with National Norms

There are difficulties in using publishers' national norms to judge the adequacy of the performance of California students. Briefly, the two main problems are (1) lack of agreement among publishers' samples; and (2) lack of timeliness. Any comparison based on a single publisher's norm group (a national sample of students tested at a given time) can be quite misleading and is a tenuous undertaking at best. Since no test is given nationwide, one must rely on various publishers' estimates of the nationwide distribution of test scores. These estimates vary from publisher to publisher and are clearly guesstimates. Part of the problem in establishing norms is that publishers are dependent on the good will and cooperation of the districts they select to administer their tests. When the districts that have been carefully selected as part of a national sample decline to participate in the norming study, the results become that much more uncertain. In addition, because of the expense involved, publishers are able to update their norms only every five to eight years.

To cope with this situation, the State Department of Education provides for the comparison of the performance of California students with the norms of a variety of tests and for updating the comparisons whenever the tests are renormed or when new tests become available. This is done by giving a sample of California students both the publisher's standardized test and the California test. In some cases no extra testing is required. Scores for a publisher's standardized test are simply collected from the school districts that administered the test to all of their students in certain schools for other purposes. The statistical techniques used to equate the two tests are briefly described in Appendix H of the 1978-79 report. The result of this type of "equating study" is to show how California students would have compared to a national norm group if, in fact, all California students had taken the published test.

This approach has several advantages: (1) the national comparisons are more timely because they can be updated as new norms become available; (2) the estimates are more stable because they do not depend on the representativeness of a single publisher's sample; and (3) the progress of California students can be assessed with a test that fits the objectives of the instructional program and simultaneously, with no additional testing, the results can be compared to national norms.

The comparisons presented in this report are based on the tests with the most recent national norms. This report also contains the results of earlier equating studies so that the reader can inspect the long-term (from 14 to 18 years) achievement test trends in California against the backdrop of national norms.

Grade Three

Table 35 contains the estimated national percentile ranks of the median score of California third grade students' performance on the reading tests since 1966-67.

Table 35

Estimated National Percentile Ranks of Median California Student Performance
1966-67 Through 1983-84

Grade Three

Content area	Test administered																
	Stanford Achievement Test					Cooperative Primary Reading Test (CPRT) (1966 Norms)		CAP Reading Test*	CAP Reading Test** (Revised)					CAP Survey of Basic Skills***				
	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Reading																		
Stanford, 1963 norms	34	34	36	36	38													
CPRT, 1966 norms						52	52	52										
CTBS, 1973 norms									55	55	56	57	58	58	59	60	62	64
1981 norms																41	45	46
Stanford, 1982 norms																45	47	49
Language																		
CTBS, 1973 norms														53	54	56	57	59
1981 norms																40	42	43
Stanford, 1982 norms																44	47	50
Mathematics																		
CTBS, 1973 norms														51	52	55	59	62
1981 norms																44	50	53
Stanford, 1982 norms																52	53	57

*The Reading Test was first administered in 1973-74. The percentile ranks are based on an equating study of the Reading Test and the Cooperative Primary Reading Test, Forms 23A and 23B, normed in 1966.

**The revised Reading Test was administered to all California students in 1974-75, 1975-76, 1976-77, 1977-78, and 1978-79. The percentile ranks are based on equating studies of the revised Reading Test and the Comprehensive Tests of Basic Skills, Form S, normed in 1973.

***The new Survey of Basic Skills: Grade 3 was administered to all California students in 1979-80 through 1983-84. The estimated national percentile ranks are based on an equating study of the new test and the Comprehensive Tests of Basic Skills, Form S, normed in 1973. For 1981-82 through 1983-84, the percentile ranks are also given for the 1981 edition of the CTBS and the 1982 edition of the Stanford Achievement Test.

The following outline should help the reader understand more fully the national comparisons:

1. The third grade results for 1966-67 through 1970-71 were based on the Stanford Reading Test, which was administered to all third grade students in California. The norms for the Stanford Reading Test were established in 1963. Thus, the gains that occurred each year are relative to those norms.

2. The third grade results for 1971-72 through 1972-73 were based on the Cooperative Primary Reading Test (CPRT), which was administered to all third grade pupils in California. The norms for the CPRT were established in 1966. The dramatic increase in scores in the changeover years was due largely to the great differences between the norms of the Stanford Reading Test and those of the CPRT.

3. In 1973-74 the California Assessment Program (CAP) developed the Reading Test. A systematic sample of one-ninth of all students tested in grade three was used in an equating study to estimate the performance of the median pupil in California relative to 1966 Cooperative Primary Reading Test norms. The results indicated little change from those of the previous years.

4. In 1974-75 the CAP Reading Test was revised and administered to all third grade students in California. The same test was used in 1975-76, 1976-77, 1977-78, and 1978-79. The results of an equating study were used to estimate the performance of California students in comparison to the norms established in 1973 for the Comprehensive Tests of Basic Skills (CTBS), Form S. As a result of the modest increases in the third grade scores, the median score of California pupil performance in grade three in 1978-79 was at the 58th percentile of CTBS 1973 norms.

5. In 1979-80 the new Survey of Basic Skills: Grade 3 was administered to all third grade students in California public schools and equated to the Comprehensive Tests of Basic Skills (CTBS). The same test has been administered since 1980-81. The median California student is estimated to be at the 64th percentile in reading, the 59th percentile in written language, and the 62nd percentile in mathematics on those 1973 norms. On more recent (1981) estimates of national averages for the same test, CTBS, the comparisons show California to be considerably lower: the 46th percentile in reading, the 43rd percentile in written language, and the 53rd percentile in mathematics.

The CAP test has also now been equated to another test with its estimates of national averages. This test is the new Stanford Achievement Test. When California third graders are compared with the 1982 norms for this test, they scored near the national average: the 49th percentile in reading, the 50th percentile in written language, and the 57th percentile in mathematics.

Grade Six

The performance of sixth graders in California declined in the early 1970s and leveled off by 1974. It has climbed steadily since then. Table 36 shows this trend in terms of national percentile ranks. A more complete description of these trends can be broken down into three parts:

1. From 1969-70 to 1973-74 the Comprehensive Tests of Basic Skills (Form Q, 1968 norms) was administered to all California sixth grade students. During this period the performance of California students declined from four to nine percentile ranks on the basis of the 1968 norms.

2. In 1974-75 the first version of the California Assessment Program test, the Survey of Basic Skills, was administered statewide. An equating study conducted that year showed that scores had improved and that if the Comprehensive Tests of Basic Skills had been administered statewide, the percentile ranks would have gone up to 48, 43, and 44 for reading, language, and mathematics, respectively.

3. A revision of the survey was administered from 1975-76 through 1982-83. An equating study showed that on the basis of the 1973 version of the CTBS, California students improved enough by 1975-76 to equal or exceed the national averages. Following the upward trend of earlier years, the 1983-84 improvement in mathematics achievement boosted the percentile rank to 60. Language leveled off at the 58th percentile. Another slight decline in reading moved the percentile rank back to 56. On more recent (1981) estimates of national averages for the same test, CTBS, the comparisons show California to be somewhat lower in reading and language--at the 51st percentile and 49th percentile, respectively--and still well above average (62nd percentile) in mathematics.

As with grade three, the CAP Survey was equated to the new Stanford Achievement Test this year. California students are at or above 1982 estimates of the nation's performance.

Grade Eight

This was the first year of statewide achievement testing of eighth grade students in California. The new test, the Survey of Academic Skills: Grade 8, was equated to two nationally normed tests--the Comprehensive Tests of Basic Skills (Form U, normed in 1981) and the Stanford Achievement Test (Form E, normed in 1982).

Table 37 shows the standing of the median California eighth grade student on the norms of the two equated tests. Both of the equating studies show a moderate to substantial drop in California student performance between grades six and eight. In reading the drop is from 51 to 39 on the CTBS and from 52 to 50 on the Stanford. A similar drop occurs in mathematics: from 62 to 48 on the CTBS and fro[illegible] to 45 on the Stanford.

In writing expression the picture is mixed. The SAT norms show a drop between grade six and grade eight: from 51 to 45. The CTBS norms, however, show a slight increase: from 49 to 50.

Grade Twelve

The performance of twelfth grade students in California declined consistently during the seventies, since testing began in 1969-70. By 1976-77 the median high school senior was at the 42nd, 33rd, and 43rd percentile ranks in reading, written expression, and mathematics, respectively, on the basis of the Iowa Tests of Educational Development (ITED) with its 1962 norms. On the basis of tests with more recent norms (1970), the ranks were even lower (see Table 38). Although not consistent, the last few years have seen some progress, especially in language, which has always been the lowest, and mathematics.

The three CAP tests were renormed on new national samples in 1978. National performance declined during the 1970s. Therefore, when California students are compared to this new norm, their standing is higher than when compared to the 1962 and 1970 national norm samples.

Table 38 includes the specific comparisons with these more recent norms. The latest ranks place California students near but still slightly below the norms on the ITED and the Tests of Academic Progress (TAP). On the Sequential Tests of Educational Progress (STEP), California is above the newer national averages in both language and mathematics.

Scholastic Aptitude Test Results

The results of the California Assessment Program are the only indicators of the level of learning of all California public high school students. The results of the Scholastic Aptitude Test, a nationally administered college admissions test, however, have received considerable attention over the last decade or so. Although the SAT results represent only a select sample of California students, they have followed a pattern similar to that of the CAP scores. They are presented here for the reader's convenience in using both sets of results to judge the educational progress of high school students.

There are advantages and disadvantages to employing the SAT results as a basis for making inferences about the effectiveness of the educational system. The key point on the positive side is that the test results can be traced over a long period of time; although the test items are changed and updated, the common 200-800 score scale allows for valuable longitudinal comparisons.

The chief disadvantage is that a select sample of all students takes the SAT. The real problem in interpreting the scores is that one never knows how representative the California and national samples are. They obviously are not representative of all students, and they may or may not be representative of the college-bound population. In California about 39 percent of the seniors take the SAT, whereas nationally about 35 percent are tested. Equally important is the fact that the test reflects almost exclusively the more advanced, higher-level thinking skills in the areas of language and mathematics. This fact is, of course, very logical given the purpose of the test--to predict how well students will succeed in college. It just means that one cannot judge, from this information, the total effectiveness of schools in reaching their various aims, especially as those aims pertain to the other two-thirds of the high school population.

Table 36

Estimated National Percentile Ranks of Median California Student Performance
1969-70 Through 1983-84

Grade Six

Content area	Test administered														
	Comprehensive Tests of Basic Skills (CTBS) (1968 Norms)					Survey of Basic Skills*	Survey of Basic Skills**								
	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Reading															
CTBS, 1968 norms	48	46	44	44	44	48									
1973 norms							53	53	55	55	56	57	58	57	56
1981 norms													53	52	51
Stanford, 1982 norms													52	52	52
Language															
CTBS, 1968 norms	43	43	39	39	37	43									
1973 norms							49	51	51	52	53	55	57	58	58
1981 norms													48	49	49
Stanford, 1982 norms													49	50	51
Mathematics															
CTBS, 1968 norms	47	43	38	38	38	44									
1973 norms							50	51	53	54	55	56	58	60	62
1981 norms													59	60	62
Stanford, 1982 norms													52	52	56

*The new California test, the Survey of Basic Skills: Grade 6, was first administered to all California pupils in 1974-75. The percentile ranks are based on an equating of the Survey of Basic Skills and the Comprehensive Tests of Basic Skills (CTBS), Form Q, which was normed in 1968.

**The revised version of the Survey of Basic Skills: Grade 6 was administered from 1975-76 through 1980-81. A second revision of the test was first administered in 1981-82. The percentile ranks, since 1974, are based on equating of the Survey of Basic Skills to three editions (1968, 1973, 1981) of the Comprehensive Tests of Basic Skills (CTBS) and the latest edition (1982) of the Stanford Achievement Test.

Table 37

Estimated National Percentile Ranks of Median California Student Performance, 1983-84

Grade 8

Content area	Estimated norm 1983-84
Reading--CTBS, 1981	39
Written expression--CTBS, 1981	50
Mathematics--CTBS, 1981	48

NOTE: The Survey of Academic Skills: Grade 8 was first administered in 1983-84. The estimated national norms are based on an equating study of the new test and the latest edition of the Comprehensive Tests of Basic Skills, Form U, normed in 1981.

Table 38

Estimated National Percentile Ranks of Median California Student Performance
1969-70 Through 1983-84

Grade Twelve

Content area	Test administered														
	Iowa Tests of Educational Development Form X, normed in 1962					Survey of Basic Skills*	Survey of Basic Skills* (Revised)								
	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Reading															
ITED, 1962 norms	52	49	49	47	47	41	43	42	42	41	41	42	42	41	39
1978 norms												44	44	44	41
TAP, 1970 norms						33	35	33	32	32	32	33	32	32	29
1978 norms												42	42	41	40
STEP, 1970 norms						34	38	36	35	34	34	35	35	34	33
1978 norms												47	47	47	45
Language															
ITED, 1962 norms	42	40	38	36	34	32	34	33	34	34	34	35	35	34	30
1978 norms												43	43	43	40
TAP, 1970 norms						25	27	26	26	27	27	29	29	28	27
1978 norms												40	41	40	38
STEP, 1970 norms						27	29	28	28	28	28	30	30	30	29
1978 norms												57	57	57	55
Mathematics															
ITED, 1962 norms	48	48	48	48	48	41	44	43	43	43	44	46	46	46	45
1978 norms												46	45	45	45
TAP, 1970 norms						38	43	41	41	41	42	44	44	44	43
1978 norms												41	41	41	40
STEP, 1970 norms						41	44	43	43	43	43	47	47	47	45
1978 norms												55	55	55	55

*The California test, the Survey of Basic Skills: Grade 12, was administered to all California students from 1974-75 through 1983-84. The percentile ranks are based on equating studies of the Survey of Basic Skills and three other tests with national norms: (1) Iowa Tests of Educational Development, normed in 1962 and 1978; (2) Tests of Academic Progress, normed in 1970 and 1978; and (3) the Sequential Tests of Educational Progress, normed in 1970 and 1978.

Table 39 presents the scores for the verbal and mathematics parts of the SAT beginning in 1972 when test results for individual states became available from the College Entrance Examination Board. Figure 13 also shows the trends for California seniors since that time and for the nation since 1960. It can be seen that California seniors were above the national average (but not necessarily above the averages of all other states) in the early seventies but declined more rapidly than the rest of the United States.

During the mid-seventies both the California average and the national average began to level off. In 1978 the trend lines began to diverge again: the national average was still slowly declining, whereas the California trend line moved clearly above the national average in mathematics (to a nine-point lead in 1981) and slightly above on the verbal part (a two-point lead).

In 1982 the national averages improved for the first time in 19 years. In 1983 that gain was maintained in mathematics, but half of the verbal gain was lost. This year, 1983's one-point loss in the verbal areas was made up, and the increase in mathematics scores was even larger than in the past two years. In California students held steady this year in the verbal component, remaining five points below the national average. In the mathematics component, California students gained two points. Although that gain is one point less than the gain nationwide, California students are still five points ahead of the national average in mathematics.

Table 39

Scholastic Aptitude Test Scores for California and the Nation, 1971-72 Through 1983-84

Year	Verbal				Mathematics			
	Male	Female	Total	Year-to-year difference	Male	Female	Total	Year-to-year difference
California:								
1971-72	466	462	464		518	467	493	
1972-73	456	448	452	-12	511	460	485	- 8
1973-74	454	446	450	- 2	509	460	484	- 1
1974-75	440	431	435	-15	501	446	473	-11
1975-76	434	426	430	- 5	500	443	470	- 3
1976-77	431	424	427	- 3	500	443	470	0
1977-78	432	423	427	0	496	440	466	- 4
1978-79	432	424	428	+ 1	502	447	473	+ 7
1979-80	429	420	424	- 4	500	446	472	- 1
1980-81	434	419	426	+ 2	503	449	475	+ 3
1981-82	431	420	425	- 1	503	448	474	- 1
1982-83	426	416	421	- 4	503	448	474	0
1983-84	427	415	421	0	502	453	476	+ 2
National:								
1971-72	454	452	452		505	461	484	
1972-73	446	443	445	- 8	502	460	481	- 3
1973-74	447	442	444	- 1	501	459	480	- 1
1974-75	437	431	434	-10	495	449	472	- 8
1975-76	433	430	431	- 3	497	446	472	0
1976-77	431	426	429	- 2	497	445	470	- 2
1977-78	433	425	429	0	494	444	468	- 2
1978-79	431	423	427	- 2	493	443	467	- 1
1979-80	428	420	424	- 3	491	443	466	- 1
1980-81	430	418	424	0	492	443	466	0
1981-82	431	421	426	+ 2	493	443	467	+ 1
1982-83	430	420	425	- 1	493	445	468	+ 1
1983-84	433	420	426	+ 1	495	449	471	+ 3

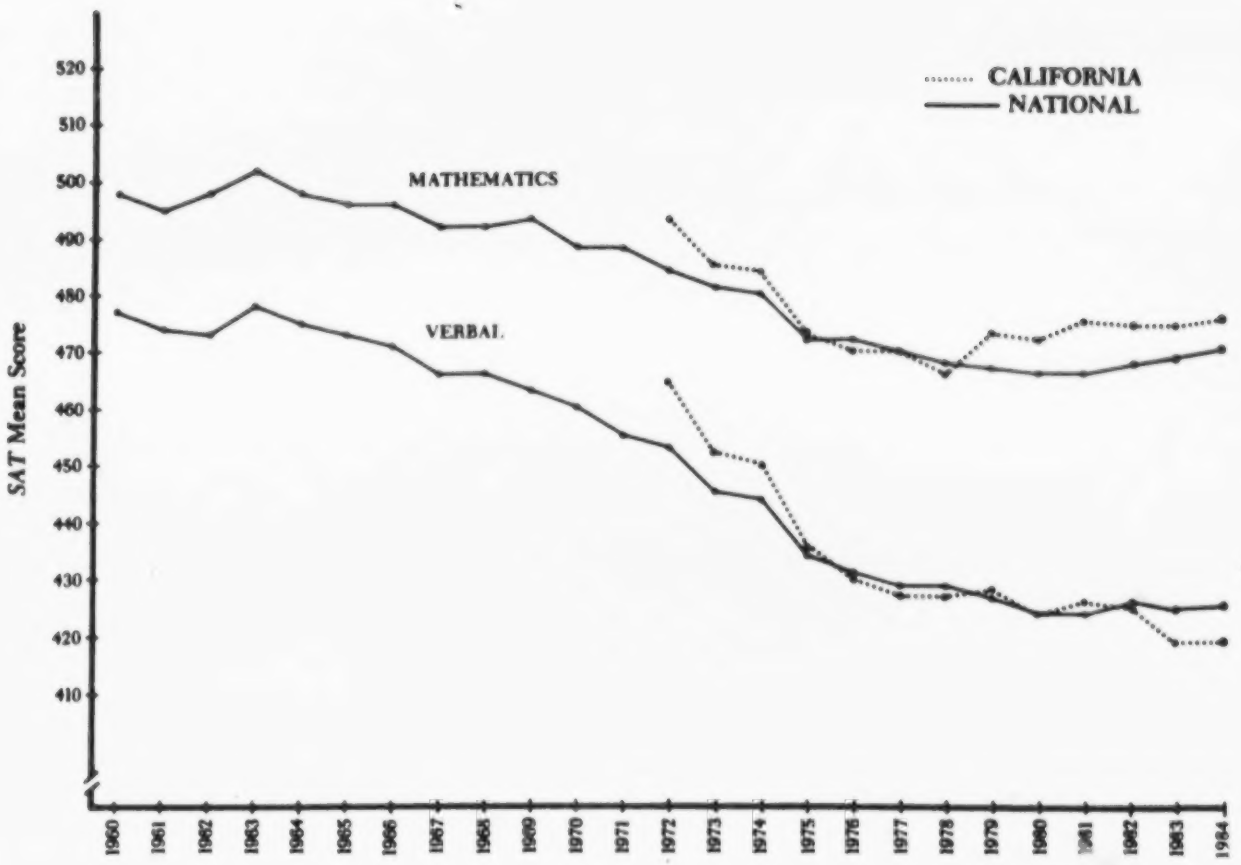


Fig. 13. ***Scholastic Aptitude Test*** **scores for high school seniors in California, 1972 (first year available) through 1983, and in the United States, 1960 through 1984**

Appendix: Assessment Advisory Committees

Listed below are the members of the Reading Assessment Advisory Committee, English Language Assessment Advisory Committee, Mathematics Assessment Advisory Committee, and the History-Social Science Assessment Advisory Committee, who were instrumental in the review and analysis of the 1983-84 findings.

Reading Assessment Advisory Committee

Vincent Abata, Office of the Sonoma County Superintendent of Schools
Catherine Beedle, San Marino Unified School District
Sandy Biren, San Juan Unified School District
Ashley Bishop, California State University, Fullerton
Jacqueline Chaparro, Office of the San Diego County Superintendent of Schools
Pat Endsley, Berkeley Unified School District
Harry Ford, Covina Valley Unified School District
Shirley Frick, San Juan Unified School District
Dorothy Grier, Chino Unified School District
Ruth Hartley, California State University, Sacramento
Cecilia Hill, Los Angeles Unified School District
Jacqueline Hodge, West Fresno Elementary School District
Jack Jones, California Polytechnic State University, San Luis Obispo
Joyce Krutop, National Elementary School District
Heath Lowry, University of the Pacific
Robert Lowry, Alum Rock Elementary School District
Jim Macon, Huntington Beach City Elementary School District
John Malkasian, Sacramento City Unified School District
Beverly Maple, San Juan Unified School District
Betty Mendenhall, Fairfield Suisun Unified School District
Donavan Merck, State Department of Education
Deborah Osen Hancock, California State College, Bakersfield
Alpha Quincy, Mt. Diablo Unified School District
Marie Santos, Denair Unified School District
Marian Schilling, Office of the Los Angeles County Superintendent of Schools
Pam Schilling, Corona-Norco Unified School District
Alice Scofield, San Jose State University
Billie Telles, Office of the Los Angeles County Superintendent of Schools
Myrna Tsukamoto, San Francisco Unified School District
Barbara Valdez, North Sacramento Elementary School District
John Walters, Office of the San Diego County Superintendent of Schools

Beth Breneman, State Department of Education Consultant to the Committee

English Language Assessment Advisory Committee

Diana Adams, Lakeside Unified School District
Sheila Anchondo, San Bernardino City Unified School District
Mary Barr, San Diego City Unified School District
Robert Beck, John Swett Unified School District

Stephen Black, Oakland Unified School District
Judy Carlton, Hacienda La Puente Unified School District
Bonnie Garner, El Monte Elementary School District
Richard Giovannoli, Biggs Unified School District
Bernard Goodmanson, Los Angeles Unified School District
Julia Gottesman, Office of the Los Angeles County Superintendent of Schools
Jim Gray, University of California, Berkeley
Louise Grindstaff, California State University, Northridge
Mel Grubb, Office of the Los Angeles County Superintendent of Schools
Wayne Harsh, University of California, Davis
Helen Lodge, California State University, Northridge
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Jim Musante, Moraga Elementary School District
George Nemetz, State Department of Education
Dale Oscarson, Palo Alto City Unified School District
Alice Scofield, San Jose State University
Linda Short, Los Angeles Unified School District
Barbara Tomlinson, University of California, San Diego
Bill Wise, San Juan Unified School District
Joanne Yee, Gold Oak Union Elementary School District

Beth Breneman, State Department of Education Consultant to the Committee

Mathematics Assessment Advisory Committee

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Joe Cooney, Office of the San Mateo County Superintendent of Schools
Clyde Corcoran, Whittier Union High School District
Richard Dean, California Institute of Technology
Sister Rose Eleanor Ehret, Holy Names College
Lyle Fisher, Tamalpais Union High School District
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Edward Silver, San Diego State University
Linda Silvey, Los Angeles Unified School District
Jean Stenmark, Oakland Unified School District
Harold Taylor, San Mateo Union High School District
Shirley Trembley, Bakersfield College

Tej Pandey, State Department of Education Consultant to the Committee

History-Social Science Assessment Advisory Committees

Steering Committee

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Marlowe Berg, Professor, Elementary Education, San Diego State University
Margaret Branson, Director of Curriculum Services, Office of the Kern County Superintendent of Schools
Diane Brooks, History-Social Science Unit, State Department of Education
Jean Claugus, Legislative Representative, California Council for Social Studies
Roy Erickson, Program Specialist, Social Studies/Multicultural, San Juan Unified School District
Jack Hoar, Consultant, Social Studies, Long Beach Unified School District
Carol Marquis, President, California Council for the Social Studies
Jan Talbot, Social Studies Consultant, Sacramento

Critical Thinking Specialists

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Arthur Costa, School of Education, California State University, Sacramento
Robert Ennis, Department of Education, University of Illinois
Edward Glaser, Human Interaction Institute, Los Angeles
Dana Kurfman, Supervisor, Social Studies, K--12, Prince George's County Public Schools, Maryland
Carol Labar, University of British Columbia
Jason Millman, Department of Education, Cornell University
Richard Paul, Professor, Sonoma State University, Rohnert Park, California
Edys Quellmalz, School of Education, Stanford University
Perry Weddle, Department of Philosophy, California State University, Sacramento

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Joyce Cox, Teacher, Ascot Avenue School, Los Angeles Unified School District
Jim Fletcher, Social Studies Teacher, Roosevelt Junior High School, Modesto City School District
Patricia Geyer, Teacher, Hiram Johnson High School, West Campus, Sacramento City Unified School District
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Jack Parks, Consultant, Social Studies, State Department of Education
Al Rocca, Teacher, Sequoia Junior High, Redding Elementary School District
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Becca Wachtmann, Curriculum Coordinator, Lucia Mar Unified School District
JoDean Wara, History/Economics Teacher, Vacaville High School, Vacaville Unified School District
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Rita King, Social Studies Resource Teacher, Office of the San Diego County Superintendent of Schools
Eleanor Mathew, Program Consultant, San Francisco Unified School District
Marylou Meerson, Curriculum Coordinator, Cajon Valley Union Elementary School District
John Phillips, Social Studies Consultant, Sacramento
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Jim Rogers, Office of the San Diego County Superintendent of Schools
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Allen Scholl, Los Angeles Unified School District
Jan Talbot, Social Studies Consultant, Sacramento
Diane Watanabe, Office of the Los Angeles County Superintendent of Schools

Geography Subcommittee

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Emmet Hayes, Geographer, La Puente High School, Hacienda-La Puente Unified School District
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Robert Richardson, Professor, California State University, Sacramento
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CAP Consultant to the Assessment Advisory Committees: Peter Kneedler

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